ELECTRICAL REVIEW

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VIEWS, NEWS AND INTERVIEWS.

A Western newspaper prints the following unique paragraph: "Can it be possible that wind alone can completely strip the feathers from a chicken and not hurt the fowl? Never; but it is possible for electricity to do this. Place a man or a woman on an insulated stool so that the electricity will not pass through the body to the earth, and then heavily charge the body with electricity, and every hair of the head, even a woman's long hair, will stand out like iron spikes or the sized hair of the Circassian show girl. No doubt if the electric charge should be increased it would drive out every hair of the head, and this is the reason that so many chickens are stripped by tornadoes." The wonderful insight and research into the effects of electricity in the particular case alluded to, shown by this modern Munchausen, is truly remarkable.

An electrically controlled machine which will effectively stamp 30,000 letters in an hour is one of the interesting inventions that has been adopted in the post office department. The letters are placed upon their edges in a horizontal hopper, and an ingenious device carries one at a time between two feed rolls. In this way the first separation is effected. A second set of feeding rolls performs another part of the work. In a simple way the inking rollers are reached, when the envelopes are stamped and passed on, one at a time, to the stacking table. A register shows the number of envelopes canceled. The date and hour in the die must be changed by hand. The various rollers are run by belts, passing over different sized pulleys, which are in turn connected by gearing to the axle of the motor.

If the surmises of astronomers about the flashing of lights on Mars be correct, the inhabitants of that planet are making a systematic attempt to signal to our earth. It has been suggested that some organized response from our planet be made and to use the 12 square miles of brilliantly lighted streets in London for that purpose. Alternate darkness and light could be obtained at intervals of five minutes if it were decided to make the experiment, and a scheme has been outlined for utilizing the whole of the enormous nightly lighting power of the United States in the same way. The scheme, if valuable results could be obtained, looks well on paper, but as a practical experiment it is very visionary.

The Western Union Telegraph Company's office in Butte, Montana, is now equipped with a quadruplex instrument which is capable of transmitting 160 messages an hour between Butte, Ogden and Helena, and the business of the office has been facilitated considerably. With long distance lines the resistance of the line must be changed every hour or so on account of different atmospheres in the long stretches of wire over mountain country. With their rheostat, however, the resistance is automatically regulated. It requires 400 cells of batteries for the new instruments.

The engineers at the power house of the Berkeley electric road, in California, had noticed the consumption of unusual quantities of coal to keep the road running, and, after two days, an investigation was made. It showed that the power wire of the Piedmont electric road had broken away from an insulator and had fallen across the Berkeley company's line. It happened that the Piedmont company's machinery got out of order about this time, but power enough was absorbed from the Berkeley line to run the line for two days. That explained the extra consumption of coal. Now the president of the Berkeley company says he is going to have a section put in the code making it larceny for one railroad company to absorb another's electricity.

It is stated that a syndicate of engineers has applied for the privilege of constructing an elevated railroad in Paris, to be operated by electricity. The project divides the city into two parts by a line running north and south. A new street, 165 feet in width, will be built which will open into the principal quarters near the Bourse, the Halles Centrales, the Palais du Senat and the Jardin des Plantes. The central part of this route will be reserved for the elevated line, which will have two tracks resting upon four rows of iron columns, 23 feet in height. The projected line will connect with all the important lines which already exist.

The amount of available water at the Shoshone Falls, in the Snake River, Idaho, is estimated as second only to that of Niagara, and it is constant all the year round. The principal fall is 950 feet wide and 210 feet high, although a second fall increases the total head to 290 feet. An electric plant, for the generation of power, is to be erected on one side of the river, the conformation of whose banks are specially favorable to the project, as no tunneling will be necessary. It is proposed to carry the current along the river from the generating station, at the falls, to points where the canyon walls are lowest, whence the water is pumped electrically into irrigating canals and sold to farmers. It is estimated that 5,500 horse-power will irrigate 120,000 acres of land.

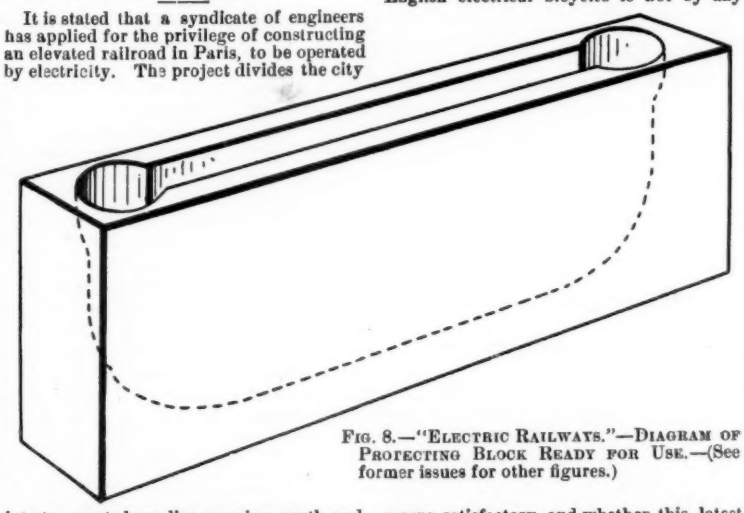


FIG. 8.—"ELECTRIC RAILWAYS."—DIAGRAM OF PROTECTING BLOCK READY FOR USE.—(See former issues for other figures.)

Electric Bicycles.

English financial papers announce that a small company is soon to be started, with a capital of $15,000, for the manufacture of electric bicycles. The electric tricycle which was designed by a well-known electrician in this country, some years ago, failed to reach the practical stage. The record of English electrical bicycles is not by any means satisfactory, and whether this latest form of bicycle will be an improvement on its predecessors remains to be seen.

A Press Club Benefit.

A great sporting carnival, given under the auspices of the New York Press Club in behalf of its building and charity fund, will be held at Madison Square Garden Saturday afternoon and evening of this week, December 17. This event is in charge of the racing and sports committee of the Club, of which George S. Dickerson, sporting editor of the *World*, is president, and W. O. Eschwege, treasurer. It promises to be a very interesting and unique entertainment, possessing a number of remarkable features, and, as the proceeds are to be given to the building and charity fund of the Club, should be largely attended by the public of New York city, and we trust the readers of the REVIEW will be present in force. Tickets, which are $1, can be secured at the New York Press Club, 120 Nassau street.

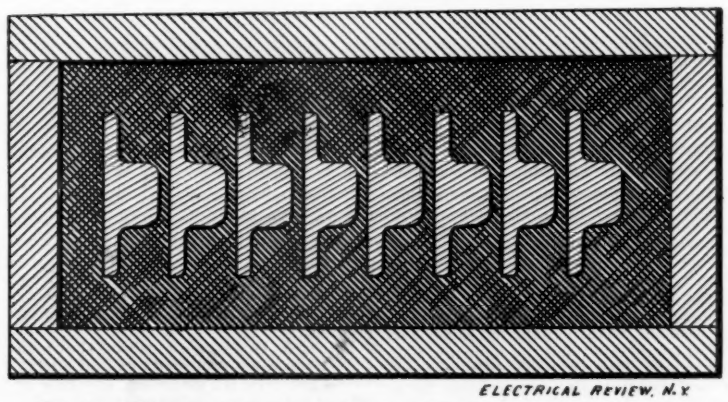


FIG. 9.—"ELECTRIC RAILWAYS."—VIEW OF METHOD OF USING OLD RAILS FOR MAIN RETURN.

ELECTRIC RAILWAYS.

CONCLUSION OF MR. McTIGHE'S ARTICLES.

How to Protect a Rail Bond from Corrosion—The Use of Old Rails as the "Main Return"—Liberal Allowance for Expansion of Traffic Always Necessary — Heavy Copper Bonds Should be Used in All Cases.

BY T. J. McTIGHE, PH. D.

Can a rail bond be protected against corrosion and electrolysis? The writer thinks it can to a very good degree of success, particularly if the whole construction be aimed to effect such result. With such a rail bond as is illustrated in Fig. 6 (see ELECTRICAL REVIEW, issue of December 10th), it is a simple and inexpensive proceeding to use a narrow block of suitable wood, which has a deep groove milled in its top edge, to allow it to be slipped up on the rail bond after the latter is in position. Before applying it, the groove is partly filled with hot pitch. Then when the block is applied the pitch closes in around the entire rail bond and leaves no point where water can collect, and very well insulates the bond from the sand which would lie against it after the street is paved. The plan is easily understood from an inspection of Fig. 8, which illustrates the protecting block ready for use. The rail bond of No. 000 wire is only eight and one-half inches long over all, and the protecting block, if made of good sound hard wood, need not be larger than seven-eighths inch thick, two and one-half inches deep and nine inches long. Such a block adds very little to the cost of construction, and if it does not entirely prevent the eventual destruction of the rail bond, it will, at least, greatly prolong its useful life.

Where the main tracks of an electric railway are at some distance from the power house, it becomes necessary to run a direct conductor from the nearest point of the tracks to the switchboard, or to the generator, to properly complete the circuit. There is not much, if any, disagreement among engineers nowadays as to the requirements of this part of the system, known usually as the "main return," or "main ground." But there has been a woeful lack of capacity in the main return in many a railroad system heretofore built, particularly in those of some considerable size operating a large number of cars. To some extent this is due to the unexpected growth of business far beyond any original calculation. But it is also due to a mistaken estimate of the helpfulness of the earth as a conductor. Plenty of cases exist where increase after increase has been found necessary in the capacity of the main return, and this has been the rule, not the exception, in the electric railways built in the past. Prof-

iting by past experience, then, it seems to the writer that a most liberal allowance should always be made for expansion of traffic, and the main return computed on such basis. Messrs. Crosby and Bell, in their most excellent work on the electric railway, advance the rule that the main return should in size be at least equal to the sum of all the feeders going out of the power house. The rule is a good one, but has not been followed in a great number of cases, and, hence, operating expenses have been piled up unnecessarily. Perhaps a more rigid rule would be to consider the main return as a distinct and unassisted part of the circuit, and compute its size on the basis of a loss of potential proportionate to the length of the main return compared with the average length of the feeders. For example, suppose there is one feeder 20,000 feet long, computed on a basis of 10 per cent. loss for average full load; and suppose that such load is 1,000 amperes, and that the length of main return is 1,000 feet. The main return is then five per cent. of the length of the feeders, and if 10 per cent. loss is to occur in the latter, the main return should be such capacity as to cause a loss of but five per cent. of 10 per cent., or one-half of one per cent. total. That would mean for a 500 volt circuit a loss of 2½ volts, due to the resistance of the main return alone.

When we come to construct a very large system, where the ordinary full load reaches well into the thousands of amperes, the main return becomes a difficult question, if it is to be constructed on any basis approximating economical operating expense. If overhead wire is considered it may mean the erection of a large number and very likely a violent opposition from property owners along the line of the main return. The most practicable course seems to be to put such a main return entirely underground.

As the cost of copper can run to a most serious figure, if the distance be considerable (on the Atlantic avenue system in Brooklyn it is nearly 2,000 feet), it becomes important to effect any economy which is possible. As most railways now under construction are in possession of plenty of old flat rails, a satisfactory solution of the question seems to be in the utilization of these rails. The main return can be readily made of them, the successive rails being connected by heavy copper plates riveted with copper rivets, whose united area will give a much greater conductivity than the rail itself. Two or more rails can be laid alongside of each other, spliced as above, laid on edge in a box of hard pine or chestnut, or even spruce, and the whole trough then filled with pitch or equivalent compound, for a total cost of about one-third what a similar capacity in copper wire or rods would amount to, and, in the writer's opinion, the durability would be very satisfactory. The foregoing assertion is upon the basis of about seven square inches of old rail section on the one hand to one square inch of copper on the other. Such a construction is illustrated in Fig. 9, showing the wood trough, the rails and the pitch filling.

The idea was under discussion at the Cleveland Convention, but in the absence of the writer it was not made clear that the rails were to be imbedded as above described in a protecting compound in a trough, and for that reason a prominent electrical authority gave it as his opinion that it had defects, because, as he believed, the iron and copper would form an electrolytic element and cause corrosion. But as the joints and rails themselves are imbedded in a perfectly water-proof material, which is also a non-conductor of electricity, there can be no electrolyte present and, therefore, no decomposition can take place from the passage of the electric current, and for the same reason there can be no oxidation. The number of heavy copper rivets used preclude the idea of heating to any material extent at the joints, particularly in view of the fact that the design involved the fresh reaming of all the rivet holes, and the tinning of all rivets before they were applied.

The pecuniary advantage in using old rails permits the placing of a heavy carrying capacity in the main return without the feeling that extravagance is being indulged, such as would be the case if copper of the same carrying capacity had to be purchased. Hence a very large allowance can be made at the outstart for further increase of traffic, and the ever-recurring necessity of adding wire after wire to the main return is avoided once for all. When one considers that an old 60-pound rail has very nearly the same capacity for current as a bar of copper one inch square, the importance of utilizing the old rails becomes very striking.

The foregoing all seems to point to the advisability of using the heaviest possible copper rail bond as short in length as noted, assuring a thoroughly good contact between it and the rails, maintaining its integrity against destructive agencies, and dispensing entirely with the "supplementary wire," which is in its usual size but a poor aid. The No. 000 copper bonds can be applied, plenty of cross bonding done, the joints protected and a track circuit of extremely low resistance obtained for much less outlay per mile of track than is possible by any of the former rail bonds (even iron wire bonds) and a supplementary wire. For all they cost it will not be extravagance for even a small 20 car road to be fitted with these heavy copper bonds.

Electricity by the Pound.

The following unique sign can be seen on Broadway:

Lightning by the Pound.
THE STAR ELECTRIC COMPANY.
Cheaper than Gas or Oil.
Requires no Dynamo, Shafting or Outside Wires.
Electric Plants from 1 to 1,000 Lights.
Arc and Incandescent from Same Circuit.
Power for Motors, Sewing Machines, and Organs.
Pumps, Boats, Presses, Street Cars.
No Danger, No Odor, No Expert.

With visions of sputtering, sparking electricity neatly done up in pound packages, a REVIEWITE mounted the steps that lead to the office whose windows bore the above sign. He wished to purchase a pound or two to take home to his family, but was disappointed. It could not be obtained. The door was safely secured by a big brass padlock, and inside was a vision of desolation that could only be equalled by that produced by a cyclone in a field of wheat. Evidently the company had moved or gone out of business. If it had gone out of business—why? Was it that they had made a superfluity of money, or was it—well, perhaps, there might have been some other reasons.

Among the many advantages claimed, those on the last line may be particularly noted. "No Danger, no odor, no *expert*"; evidently these were considered by the "company" as three great nuisances. The element of danger has prevented many an invention from succeeding. A disagreeable oder has prevented many oil lamps, otherwise well conceived, from becoming commercial successes, and perhaps the element of "expert" has prevented the Star Electric Company from becoming a commercial and likewise a practical success.

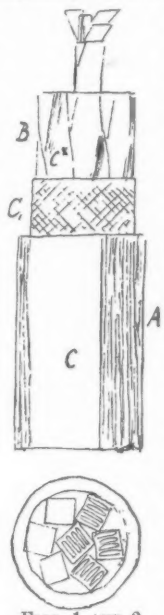
The numerous and highly imaginative improvements were perhaps too much for the average investor, and the company, like the man who stood on London Bridge for a day and failed to find a purchaser for a genuine pound note, which he offered for sale at one shilling, has been unable to make our generous public believe implicitly in its capacity for the production of miracles, and it has, therefore, sunk into obscurity, and disappeared like a shooting star.

"It is stated that the electric lamp used as footlights is harder on the eyes of the performer than either gas or candle light." This remark was possibly made by some traveling Thespian, to whom the glare and brilliancy of the electric lights in some well lighted theatre seemed strange and unfamiliar. It, however, would soften the glare of the light considerably if the globes of the lamp were made of ground glass.

Messrs. Felten & Guillaume's New Telephone Cables.

TO THE EDITOR OF ELECTRICAL REVIEW:

Among the German cable manufacturers, the firm of Felten & Guillaume takes the foremost rank, their work being only rivaled by Siemens Bros., of Berlin. As is well known, Messrs. Felten & Guillaume have been experimenting for years with a view to improve the existing forms of electrical cables. Now, as one of the great drawbacks for the extended use of cables (perhaps the greatest), in rapid telegraphy and telephony, is their electrostatic capacity, producing retardation and deformation of the electric impulses, and, as for alternating currents of high frequency (such as must be used in the electrical transmission of sound and in the Wheatstone automatic method of telegraphy), a large electrostatic capacity of the cable detrimentally affects the receiving instruments at the other end of the line, all cable manufacturers have paid much attention to the elimination of this evil, or at least to find means to reduce it to its minimum baneful effect.

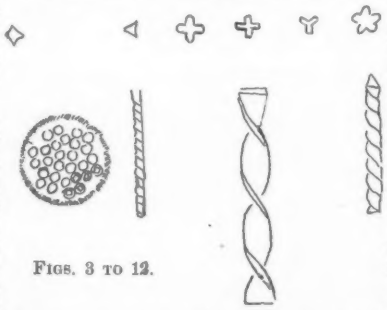


FIGS. 1 AND 2.

Speaking of high frequencies, it should be born in mind that in the Wheatstone automatic method of telegraphy, when transmitting at the rate of 600 words per minute, there are 36,000 currents per minute sent out, each having a duration not exceeding .002 of a second, while in telephonic transmission, according to Lord Rayleigh's authority, the average number of vibrations amounts to about 3,600 per second, and sibilant sounds may produce 4,000 to 5,000 vibrations per second. Thus, it is evident that in telephonic transmission we have to deal with electrical currents having an enormous frequency. Bearing this in mind, it is plain that the electrostatic capacity of a cable plays a very important part in modern telegraphy and telephony.

Next to air, paper, and especially manilla paper, has been employed lately for the insulation of adjacent conductors in cables, and by its use the capacity of our present telephone cables has been decidedly decreased.

While the specification of the London-Paris submarine cable still called for .3045 microfarads per knot, some of our New York firms now manufacture cables having a much lower capacity, *i. e.*, .05 microfarad per mile.



FIGS. 3 TO 12.

Felten & Guillaume's cables, shown in Figs. 1 and 2, are protected by a lead pipe C. Below the pipe is a protecting envelope or serving, formed of quadrangular strands C^x, each consisting of four flat conducting strips, of which the two exterior form one, and the two interior the other circuit. The torsion of these strands produces a solid, yet withal flexible cable, while the super-position of the several circuits prevents mutual inductive effects. Again the ribbon form of conductor may be used either to increase or decrease the capacity by the use of an air insulating space between the conductor and insulating medium. Figs. 3 to 12 show the different shapes of flat conductors, and it is quite evident that, by covering the flat conductors with a paper insulation, there will be an air space between the conductor and insulating material which, of course, tends to cut down considerably the electrostatic capacity of the cable.

P.

TELEGRAPH NOTES.

The Postal Telegraph Company are placing poles and wires in East St. Louis.

Work has begun on the new telegraph line between Raleigh and Richmond, N. C.

The Printer's Telegraph Company, of Boston, are building a telegraph line between Boston and New York.

The State Subway Commission has ordered telegraph and telephone wires underground in Jersey City and Newark.

The Postal Telegraph Company in California has inaugurated a district messenger service, whereby small packages, letters or parcels will be delivered at small cost.

A secret meeting of the Order of Railway Telegraphers was held at Mauch Chunk last week. Almost every road running through northeastern Pennsylvania was represented.

J. E. Morris, manager of the Western Union Telegraph Company, of Oakland, Cal., has resigned and has been succeeded by E. G. Folger, of that city, formerly with the telegraph company in San Francisco.

A new schedule of wages will soon be submitted by the Rock Island telegraphers, of the Chicago, Rock Island and Pacific system. It provides for pay for overtime, as is paid by connecting lines and fixes a minimum salary of $45 per month.

A special meeting of the executive committee of the Western Union Telegraph Company was held to adopt resolutions on the death of Jay Gould. Dr. Norvin Green, president of the company was in the chair, and a set of resolutions offered by Mr. Sloane were accepted.

John W. Mackay is very busy with his gigantic cable and telegraphic enterprises. News has already been received of a big advance in the shares of the Commercial Cable Company (with which Mr. Mackay is closely identified) to $180. A year ago these shares were quoted at $125.

A meeting of the stockholders of the Southern and Atlantic Telegraph Company was held at the Western Union building, and the following board of directors elected for the ensuing year: Norvin Green, Thomas T. Eckert, J. B. Van Every, R. H. Rochester, Henry Hentz, C. A. Tinker, John Van Horne, William Butler Duncan and Arthur B. Graves.

The Reading Railroad Company has decided to build a new copper telegraph line from Pottsville to the Shamokin scales. The line will be 72 miles long and it will probably take until spring to complete it. The new line is to be used by the Coal and Iron Company in communicating with the collieries, and for the regulation of the movement of cars, etc.

Some hot-headed individuals in Shepherd, Texas, tore down a number of telegraph poles and carried away all of the wire in the vicinity. They left a notice on the skull of a horse which read. "If the railroad company does not pay for the stock killed, its railroad will be torn up." Evidently these destroyers of the company's property imagine that they had achieved a unique revenge.

The new scale of wages granted the Baltimore and Ohio telegraphers recently went into effect on December 1. The men did not get exactly what they wanted and it looks as if strikes do not accomplish what it is desired they should. This advance in salaries, although slight, will amount to about $33,000. To make up this amount the Baltimore and Ohio have decided to cut down their force of operators.

The duly qualified representatives of the hitherto conflicting Orders of Commercial Telegraphers of North America and Commercial Telegraphers of the United States recently met in this city. It was agreed that the interests of both associations should be merged, and that the Order of Commercial Telegraphers of North America should be recognized as the only organization of commercial telegraphers on this continent.

Advices from Boston state that in that city it looks as if a petition with a large number of names would be sent to the Legislature this year, asking for a resolution in favor of governmental control of telegraph and telephone companies. The petition has been started through the efforts of the Second Nationalists' Club, of Boston, and it began its circulation, by chance, we suppose, the very day that the man who controls the Western Union Company died.

LITERARY.

The "New Dynamo Tender's Hand-Book," by F. B. Badt, contains 226 pages, as against less than 100 pages in the old book. It has been entirely re-written and re-set; no old matter, old type, or old plates having been used. This is a particularly valuable work for the practical man, and the new edition will no doubt be welcomed in electrical and engineering circles generally. Price, $1.00. Address this office.

Joe Kerr's "Jests, Jingles and Jottings," by Allen & Co., N. Y., is one of the most refreshing publications of the day. Mr. Kerr, the author, possesses a fund of humor peculiarly his own, his "Office Boy," observations being the best thing of the kind we have ever seen. The book is tastefully illustrated, and is, we are pleased to learn, meeting with a large sale. A telephone story, which we take from its entertaining pages, appears in another column of the ELECTRICAL REVIEW.

The Christmas number of *Scribner's Magazine* is made notable by the great richness and variety of its illustrations, including a novelty in magazine pictures—a colored frontispiece—reproducing in *fac-simile* the rich effect of a water-color painting, made for this magazine by L. Marchetti. The literary quality of the number is indicated by the distinguished list of contributors, including such names as Thomas Bailey Aldrich, Archibald Forbes, George W. Cable, Frank D. Millet, H. H. Boyesen, Octave Thanet, George A. Hibbard, Will H. Low, and Kenyon Cox. The articles present a striking group on certain phases of modern art, bringing in the same number a discussion of French Wall Paintings, American Decorative Art at the World's Fair, Norwegian Painters of the Present Day, and a brief discussion of Why We Paint the Nude, by two eminent American artists, with a full-page picture by each to illustrate the text. The fiction of the number is remarkably bright and happy in tone, and full of delicate sentiment. Archibald Forbes, the famous war correspondent, writes, in the Historic Moments' series, a description of the Triumphal Entry into Berlin of Emperor William and his victorious armies in 1871.

BOOK REVIEW.

"ORIGINAL PAPERS ON DYNAMO MACHINERY AND ALLIED SUBJECTS," by John Hopkinson, M.A.D., Sc., F.R.S. New York: The W. J. Johnston Company, Limited, 1892; 249 pages, 98 illustrations, price, $1. Supplied by ELECTRICAL REVIEW.

This collection includes all written on electro-technical subjects by the distinguished author, most of which have marked eras in the advance of electrical science. Perhaps no other contributions to electrical literature since the days of Faraday have been of as an important character as those contained in the present volume, and this is true, whether considered from a theoretical or from a practical standpoint.

In the first paper that invaluable aid to the study and design of dynamos, the characteristic curve, was first announced, and the following three papers are devoted more or less to developing its applications.

The fourth and fifth papers, on the theory and design of continuous current dynamos, furnished the fundamental principles upon which the design of such dynamos is now based.

The sixth paper established the important principles in regard to coupling alternating current machines; the next three papers are on the transformer, and the remaining two are on the theory of the alternate current dynamo and electric lighthouses, respectively.

The majority of the papers contain no mathematical formulæ, and several others so little as not to prevent their being understood by a non-mathematical reader.

These papers, with the authorization of Dr. Hopkinson, are for the first time published in a collected form and rendered accessible to the general public, and they should furnish a fruitful source of inspiration to those in search of knowledge at first hand.

A New Fire-Damp Detector.

According to Mr. T. J. Murday, the inventor, this instrument is 25 to 30 times more sensitive to fire-damp than any safety lamp now used in the examination of mine workings. It indicates the presence of less than 0.1 per cent., or about the one-hundredth part of the amount of fire-damp necessary to form an explosive mixture. It depends for its action on two platinum wires connected with an indicating pointer by levers, through which a momentary electric current is sent by depressing the small knob shown in the illustrations, at one end of the handle. One of the platinum wires is protected by an air-tight cylinder, the other being exposed to the atmosphere inside a cylinder of gauze. In pure air, when the current passes through the wires, there is no deflection of the indicator, because both platinum wires are equally heated, and, therefore, expand uniformly; but when fire-damp is present the exposed platinum wire, heated by the electric current, starts combustion in the surrounding gas. Additional heat is communicated by this combustion to the electrically heated wire, so that the wire expands and causes a deflection of the pointer corresponding to the amount of fire-damp in the air. The pointer indicates on the lower dial, shown in Fig. 1, which is divided up to three per cent. To make the instrument more complete, an alarm bell is attached as shown in Fig. 2. This may be set to ring at any percentage of fire-damp by means of the thumbscrew and pointer, shown on the upper dial in Fig. 1. If this pointer is set slightly above the zero of the scale, say, at 0.1 per cent., before commencing a search for fire-damp, and the knob on the handle is occasionally pressed, the bell will ring immediately fire-damp to that amount is met with.

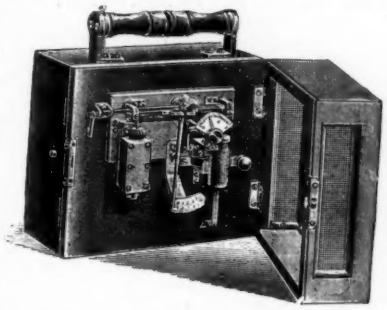


FIG. 1.—THE MURDAY FIRE-DAMP DETECTOR.

The mechanism of the instrument is shown in Fig. 1, the front being open. There is a free access of air through the wire gauze at each end of the case. The front is fitted with glass so that the dials may be inspected without opening it. In Fig. 2 the case is opened to show the alarm bell and the dry cells for giving the requisite electric current. As this current is taken only at intervals for one second each time, the cells will last for a considerable period. The instrument can be used in an explosive mixture of gas without danger of ignition, as the heated platinum wires have a double casing of wire gauze. The instrument, however, is not intended to indicate the percentages near explosive point, but to show the existence of quantities too small to affect ordinary safety lamps. The dials are, therefore, only divided to three per cent.; but they can be graduated up to explosive point. When not in use the tension of the multiplying levers and springs should be taken off the platinum wires by pressing a small lever at the side of the cases, so as to avoid fracture of the wires through a blow or jerk. Should the wires be injured new ones can be easily and quickly inserted.

The patentees claim that the instrument can be used under any circumstances, and by any one, without previous acquaintance with its working. The apparatus is always ready; its indications are instantaneous, and need no calculation on the part of the person seeking for fire-damp. It can be fixed in any part of a mine and connected by wire to a clockwork, and a register kept in the office above ground of the varying quantities of gas in that part or section of the workings in which it is fixed. Messrs. Gent, of Faraday Works, Leicester, England, are sole manufacturers of the instrument and joint owners with the inventor of the patent.

Christmas is Coming and the Jokers Are at Work.

[The Joker of *Truth* Presents this List.]

IN 1892.

MRS. HICKS—Do you believe in a really and truly Santa Claus?

DICK HICKS—Of course I do, mamma. (Aside) I think it is too cruel for children to undeceive their parents in such matters.

PAPA'S SUGGESTION.

MISS FOSDICK—(who is self-willed)—I wish I knew what to give dear Charles for a Christmas gift.

FOSDICK, *père* (who hates "dear Charles")—Give him a wide berth.

BOTH PLEASED.

"My dear," said Mr. Bloobumper, on Christmas morning, "here's a box of superb cigars I have bought for your Christmas present."

"How thoughtful of you, you darling!" replied Mrs. Bloobumper. "I hope you will appreciate this seal-skin sacque which I got for you."

GUILE.

DIX—If my wife asks you my brand of cigars between now and Christmas, tell her these, and, say—

DEALER—Yes.

DIX—Don't charge her over a dollar a box; I'll pay the balance.

What the Genial "Puck," of New York, Has to Say.

SMART.

"What are you boys going to get your mamma for a Christmas present?"

"Won't you tell?"

"No."

"A pair of slippers with soft wool soles."

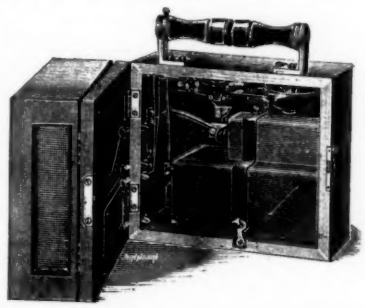


FIG. 2.—DETECTOR WITH ALARM BELL ATTACHED.

PAID FOR.

Mrs. Bridie—"Why is it you don't make me as many handsome presents as you used to before we were married?"

Mr. Bridie—"Eh? Oh, I guess I must have been buying you on the installment plan, my dear."

A USEFUL GIFT.

Grinne—"I've bought this necktie for a present for Barrett, my room-mate."

Smyles—"He can't wear that. It doesn't suit his complexion at all."

Grinne—"I know; but it suits mine!"

"Don't spend in gifts the money you owe your washer-woman."

"Price marks on Christmas gifts are not to be regarded as emblems of veracity."

A MEASURE OF ECONOMY.

KNOX—Hallo, where have you been?

FOX—I passed the Christmas holidays in Bermuda.

KNOX—You don't know anybody there, do you?

FOX—No; that's why I went.

The woman who can circulate most through the stores the first three weeks of December can approximate most closely the value of the presents her friends receive.

MUCH THE BETTER PLAN.

"Did you make any Christmas presents, Barton?"

"No; I bought what I needed."

ELECTRIC LIGHT FLASHES.

It seems to be a well recognized fact that an electric plant thrives best in the dark.

A number of Philadelphians have organized the Cinnaminson Electric Company to furnish Riverton and Palmyra with light.

Gloucester City, N. J., has renewed its contract with the local electric light company for five years at $160 a lamp per year.

On May 1, 1892, the metric decimal system of weights and measures came into force in all the government administrations in Egypt.

The citizens of Lexington, Mo., are now discussing the subject of electric lights, and it is expected that the city will soon be lighted by electricity.

The work of putting in the machinery at the new power house of the Ottawa Electric Light Company has commenced. The machinery will all be in this year.

The Electric Light Company, of Taunton, Mass., are progressing finely and their business is increasing at such a rate that they expect to purchase several more dynamos in February.

A special election to decide whether Batavia should own and operate her own electric light plant at a cost of $21,000 was held recently. There were only 336 votes polled, of which 140 were in favor of the plant and 196 against it.

The sixth annual ball of the employés of the Citizens' Electric Illuminating Company, for the Mutual Benefit Association, was held on Monday evening, December 5, at the Criterion, in Brooklyn. The affair was quite a success and was well attended.

At a town meeting in Putnam, Connecticut, it was voted to contract with the local light and power company for 30 arc and 23 incandescent lights for $2,500, for a period of five years. The town will also pay $225 towards the installation of the ten new lights.

The *Commercial Bulletin*, of Boston, states that Westinghouse stock has been very weak during the past week. There have been indications that insiders and members of the old pool have been quietly picking up a lot of this cheap stock, and the recent advance was no surprise.

The Siemens-Halske Company, the great electrical house of Berlin, has applied for an ordinance in Chicago to enable it to distribute electric light and power over that city. The company is erecting large works and evidently proposes to be a vigorous competitor of the General Electric Company.

United States Consul O. F. Williams, at Havre, says, in his recent report on "Electricity and Conduits in Havre," "It is my belief that knowledge of what is here at Havre will not be of value, further than to show its insignificance, as contrasted with kindred enterprises in American cities of like population and importance."

The United Electric Light Company, of Springfield, Mass., has purchased the majority of the $225,000 capital stock in the Indian Orchard Company mills at Indian Orchard, with the idea of using the water power of the latter for running their plant. This company controls about 1,400 horse-power of water privilege. The stock was bought at 112 per share.

Edison vs. Westinghouse.

The suit of the Edison General Electric Company and the Edison Electric Light Company against the Sawyer-Man Company was called before Judges Wallace, Lacombe and Shipman, in the United States Circuit Court of Appeals on December 6.

A few weeks ago the Edison companies applied to the Circuit Court for an order restraining the Sawyer-Man Company from manufacturing or selling incandescent lamps.

In order to secure a speedy settlement of the suit, an injunction was granted and at once stayed upon, the stipulation that the stay would be dismissed if the Sawyer-Man Company was not ready to proceed with the appeal.

Clarence A. Seward represented the Edison Company, while Elihu Root, Leonard E. Curtis and Edmund Wetmore appeared for the Sawyer-Man Company.

ELECTRIC TRACTION.

THE DISCUSSION OF THIS IMPORTANT TOPIC CONTINUED.—REMARKS OF LIEUT. SPRAGUE, MR. MAILLOUX, MR. LEONARD, DR. HUTCHINSON AND OTHERS BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

Mr. Sprague: I have a few remarks to make on those subjects. Those who have visited the beautiful Moravian cemetery in Salem, North Carolina, or that in New Orleans, where they bury the dead above the ground in tombs, or in country towns where lovers stroll on Sundays, have doubtless often noticed one inscription on the stones which mark the resting places of those who in life perhaps were filled with great hopes and ambitions. That inscription is "*Requiescat in pace.*" When in Chicago some four months ago I heard Mr. Perry's article on "Series Electric Traction," and Mr. Leonard's on "A New System of Electric Propulsion," that thought came to me—better let them "rest in peace." In these four months there has been no resurrection. I feel now as I felt then. If there was good in these systems it would work out its own salvation, and if the defects which seems to be apparent were there, they would of themselves eventually condemn them. So satisfied am I on that I see no reason to change my opinion. The series system of electric propulsion is absolutely dead. Every now and then an attempt is made to revive it. It has been tried on one or two roads in England. It has been tried on one or two roads in this country, but if I may make reference to Mr. Snort's own work, his experience has been a suggestive one. He started five or six years ago on the series system in Denver and elsewhere, and about four years ago in West Virginia. It is dead. And then he went on to the double-wire multiple arc system overhead, as did the Thomson-Houston Company in Cincinnati, to accommodate the local requirements of the telephone interests, and that plan is practically dead, and we have come, on the 500 railroads in operation in the United States and elsewhere, to one single method of operation, a multiple arc system of distribution, with a single wire overhead—and that is where we will stand. I have no hesitation in putting myself down as a prophet in some of these matters. There have been great advances made in the last three or four years in electric railways. My own connection with them for the past two years has not been active. I am now going into a different class of work. But while there have been improvements in price and improvements in mechanical applications, more perfect machinery, greater interchangeability of parts, there has been little if any increase in the actual economy. Four years ago 40 cars were running on the Richmond road with engines of 375 horse-power, in other words, nine horse-power per car at the central station. Every car on that line was doing all that it could do. We have, in fact, retrograded in some respects, and the number of accidents which are to-day cited, sometimes justly and sometimes unjustly, in opposition to the trolley system, is due in a large part to turning backward, and to the additional complication of apparatus. The plan which seemed to me to be the proper one was to give the man who ran the car as little as possible to think of. All that he should be required to do is to move a lever—as small as convenient—one way to go ahead and to pass through all the gradations of starting, increasing the speed, going at full speed, and, by reversing that movement, by a single stroke of the hand, to pass through the retrogression of those changes, to reverse his machine and to run in the opposite direction. That plan has been abandoned. Two levers must now be used, and many a life has been the forfeit. The demands of street car service have continually increased. We can no more creep up a five per cent. grade at three miles an hour to-day than we can put a horse on the car to pull it up. The schedule time of roads will not permit of that operation. At first it was 15 horse-power to a car; to day it is 20, 30 and sometimes a 40 horse-power equipment. Why? Not because of the requirements at starting, but simply because when running at the full speed at which the machine will run when loaded, with the cars, with the trucks, with the passengers carried, the motors are required to do that amount of work when working under the highest possible efficiency for which they are built. We cannot go back.

Referring a moment to the question of control; I have noticed in recent observations of some of the roads, that the motorman is required to operate two sets of apparatus. He has his regulating apparatus for varying the speed of the car. He has his independent switch apparatus for varying the direction of motion. What is the result? A man is pulling along at 12 or 15 miles an hour with a tow-car behind him. He is traveling a car length in a second. Another car comes along in an opposite direction, and some man, dull of hearing or short sighted, steps in the way. If the car is controlled by a single movement, which responds instantly to the wish of the motorman, he has got the power, independent of his brakes, and quicker than they can operate, of bringing his car to rest before he has run over that passenger. But if he has got first to cut off his current, move the reversing switch, and put on his current again, he has passed double the length of the car before he can stop it. I say in that respect we have retrograded in street car work when we have added two movements, instead of running with one.

I had intended to comment in detail on this system of Mr. Leonard's. Independent of any possible merits of the plan, there are, I am sorry to say, many inaccuracies; some have been pointed out by Dr. Hutchinson, and there are others which Mr. Leonard himself may notice in looking over his notes. There is much assumed in the matter of economy, but when we consider the time limit involved in starting, I unhesitatingly assert that the amount of coal burned in the central station will be fully as great, if not greater, by this plan, than with the system of direct supply, because of the amount of energy needed for the continuous rotation of the power converter.

He has made one reference to elevator work. It is an unfortunate allusion. An elevator is in some respects the hardest sort of railroad service. I have a record made over a period of about 11 months on an elevator driven by a motor which is a compound machine, governed purely by a rheostat. This motor runs for 10 hours a day. It is a very fair example of good elevator service, so far as the element of time is concerned. It stops at five floors of a building, carries both freight and passengers, and is practically in continuous service. Its operation is much more continuous than very large numbers of hotel elevators and many office building elevators. That record shows that for 10 hours duty a day there is used at the terminals of the motor the equivalent of about 100 amperes at 240 volts for one hour. These are from meter records and meters were never known to lie in favor of the customer. We run about 250 feet a minute, stopping at every 10, 20 or 30 feet, and oftentimes running slow. There is not used in the rheostat itself over 10 per cent. of that energy; that is, 10 amperes at 240 volts for one hour. An elevator of that lifting capacity, if driven on a three motor scheme, would have to be supplied with a motor and dynamo of at least equal capacity, driven by a motor of about 30 horse-power. Two of these machines would normally, of course, have to run all the while. Of the size specified, they could not be run from a 240 volt circuit for less than about 15 amperes. Consequently, we have the equivalent of 150 amperes at 240 volts for one hour. In other words, for the system of regulation alone to take the place of the rheostat, there would be used 150×240 watts against a total present use of only two-thirds of that, and against a use of one fifteenth part of it for the rheostat. So I say this is probably a clear illustration of how the time element enters to continually cut off the efficiency of the system where you have anything that runs continually.

With regard to the method of operating by shunt machines, I would say that, in 1886, on the elevated railroad, I operated two machines which were of this character. Subsequently they had a small series field introduced. The speed of the car was controlled there first by the rheostat and second by variation in field strength, and part of the energy of the car was delivered back to the line in slowing. Later, if I remember rightly, we introduced the series method of regulating the machines as well. In Richmond, the following year, I did do that. With machines of even ordinary weight, that is, 100 pounds to the horse-power, if the series multiple method is used with the armatures alone, and there is a variation of the field strength, you can get a variation of from one to three in the speed without any difficulty whatever, and that eliminates all difficulty in starting. In other words, if the maximum speed you wish to run is 15 miles an hour, you can easily run at a high efficiency at five miles by simply strengthening the field and throwing the machines in series where you have got a good track and a sure method of contact. When taking into account the fact that you can return a certain amount of energy to the line, I question very seriously if the shunt method will not hold its own in time, even on a great many lines of street car service.

The difficulty which Mr. Hewitt has pointed out, that the two motors were not in ordinary street car practice run on different circuits is explained in this way: When motors were first built, there was an assumption that the motors could be built to run alike. The current was made to divide itself in the two fields equally and then meet and divide itself in the armatures. Afterwards we found the difficulty which is pointed out by Mr. Hewitt, but it was too late to change our switches, because we had some thousands in operation. In fact, we were under the same conditions that every manufacturer of apparatus made under stress is. If the two circuits are separate, then a large part of the difficulty, I should say three-fourths, if not more of it, would disappear at once.

Dr. Hutchinson: There is one word which might be added to what Mr. Sprague says about speed on grades and the power required in the power station. We are running a line, as he knows, in Baltimore, on a six per cent. grade and carrying cars up that grade at eight miles an hour. Then there are in use 60 horse-power equipments on a car, instead of 40. We make on that road a daily mileage of 205 miles with one car, the highest I ever heard of. The rest of the cars make 190 miles. I have in my hands a lot of tests which I made two years ago, showing the indicated horse-power per car, measured from engine cards on the old Sprague double reduction motors. The lowest was 6.2 indicated horse-power; the highest, eight. If you measure the same thing now you will get anywhere from 12 up to 18 and 19 indicated horse-power.

Mr. Mailloux: There is one point which I think has been neglected entirely in connection with this discussion; though it has perhaps equal importance, at least, with the methods of motor regulation, so far as the economy of running and cost of the power is concerned. I said a little while ago that the cost of power itself was very small, and it was usually smaller than the cost of the depreciation. It seems to me that if we want to make it still smaller, if we want to reduce the cost of power pure and simple still further, that there is a much wider margin to work upon in the station itself than in the cars or motors. A number of engineers have investigated this subject, and it has been shown that, owing to the constant fluctuation of the load, and the fact that the power is constantly varying; that the engine is cutting off at full stroke and then at very short stroke, in very rapid succession, the average (mean effective) economy, so to speak, of the engine is very poor. For that reason, more than any other, compound engines have not turned out the results which were expected of them, and we do not obtain from the coal used the horse-power that we ought to—not by 15, 20 or 25, sometimes 40 per cent. It seems to me that it is there we must look for any radical improvement in the amount of power consumed to propel the cars. The amount of energy wasted in starting, as has been sufficiently shown, is relatively insignificant, but in the station we have a large margin to work upon—a leak at the bung-hole, as it were, as compared with the spigot (regulator) loss. I believe various methods have been submitted for increasing the station efficiency. I advanced one myself some two years ago, which has not been popular because the storage battery was used as a factor in it. There is, in my opinion, a good time coming, when the storage battery will have its innings, and will be used in every electric power generating station; but meanwhile there may be other ways available or possible of equalizing the load, and thereby increasing the efficiency of the plant. A method has been advanced, depending on a peculiar form of steam engine, by a concern which makes an engine that is said to have almost constant economy under very wide ranges of load. The makers claim to have been able with their engine to reduce the water consumption for given duty from 40 pounds per horse-power per hour, to 26 and 30, which results, if correct, ought to receive the attention and consideration of electrical engineers.

Mr. Sprague: I may speak of one or two matters that have recently come to my knowledge. As regards the amount of coal used in central stations, it is undeniable that the central station presents great possibilities of improvement. People who are building to-day any large isolated plant can easily get from engine builders a guarantee of a horse-power delivered to the shaft of a dynamo directly connected for not exceeding 25 pounds of water, and the dynamos are now rated at 92 per cent. We are going to have increased efficiencies in our central stations when we adopt direct connected machines.

As to the method of regulating larger machines, my own impression is this: That for the larger railroad work, of course, it is essential that there should be at least two, and possibly four, machines in operation, on account of the weight, methods of attachment, etc. The series multiple system will be used for running at variable speeds. The machines will be compound wound. The rheostat will be a very small factor. I am now concerned with some others in building an electric locomotive of about 700 horse-power, that has four motors of 175 horse-power each. The adoption of four machines in place of two was determined, not by the difficulty of building two machines, nor by the difficulties of regulation, but simply because the space at our command required that arrangement. Suppose those machines run at 30 miles an hour under full load and best conditions, that is, when all four are multiple; they will run about 14 miles an hour when run two in series and two parallel; they will run six miles an hour when all four are in series. When you get down to six miles an hour, you have got down nearly as far as you want to go. If, now, we have in addition the method of control by varying the field, we increase these variations of speed at least 50 per cent. I think that in the work now being done by the General Electric Company for the Baltimore and Ohio Railroad, under the original Thomson-Houston plan, they will use four or six machines in these various combinations. It seems to me that the best method, when properly connected, is to run them in series and multiple combinations. There is no difficulty in changing from one to the other, provided you have got proper field regulation in addition.

Mr. H. Ward Leonard: Mr. Chairman and gentlemen: I think that never since I first thought of this system of regulation have I felt quite so much encouraged as this evening, for after having had my figures, for several months at any rate, and having examined them, that Dr. Hutchinson should find that I only claimed 97 per cent., and when he is willing to grant that it may possibly be 20 per cent. and upwards, it shows me that I have something to work for, and with the possibility of success. The fact, joking aside, in regard to the question of efficiencies, is that quite accurate tests have been made of the system by a concern so well equipped for making tests as Wm. Sellers & Company, of Philadelphia, and that the efficiencies shown by the tables in this paper have been quite well borne out. I may say, while I am on that subject, that the losses in the fields and the friction, and the foucault current and the hysteresis losses which I have assumed, are derived principally from the tests of the Franklin Institute, and are also checked by the data of the test averages of the Edison dynamos, and I think they will bear the closest scrutiny. As regards the figures I have given in the tests, Dr. Hutchinson has pointed out one or two apparent errors, but I think it is due to a misunderstanding of one or two points by him. One point which he spoke of was the impossibility of having a central station equipped with only six horse-power per car when in one of the most favorable cases he figures out 11¼ horse-power as required by a car. Without stopping to check that figure, I would say that I did not intend that six horse-power in the central station would be enough if every car were in operation simultaneously at its full power, but that six horse-power per car would be an average figure, some of them being at rest or going slowly, and some coming down grade, under which conditions they would assist the central station.

Another point that Dr. Hutchinson spoke of was the fact that in the table No. 1 there are 11¼ kilowatts which he says had to be entirely absorbed by the motor of 7½ kilowatts. But I call attention to the fact that the 11¼ kilowatts is not all absorbed by the first motor, but a large portion of it is in the field and armature circuits of the second and third machines, and that the first machine is not overloaded. Similarly, without checking the figures up, that 97 per cent. efficiency, which he figured out, must be the result of some error.

Dr. Hutchinson: I beg your pardon—87—I may have said 97; I meant 87.

Mr. Leonard: Eighty-seven would be about correct, because that corresponds to the efficiency of the Edison machine of that size. The saving at the central station, due to the size of the apparatus, of course, is a factor which we can only theorize on, but I think that, in view of Mr. Shepardson's curves, it is rather evident that, if we could supply a system in which the very large changes of load due to the starting of the car could be avoided, we could get along with less dynamo and engine capacity in the central station, and by the results of tests on traveling cranes and a few elevators, and by the figures of railway tests, I am convinced that the central station capacity in engines and dynamos could be cut in two. However, I wish to call attention to the fact that the cost of the street car apparatus to-day is not such an important factor as to very materially affect the cost of the entire equipment. In one installation that I am making to-day the entire cost of the street car motors is only about five per cent. of the cost of the complete work, and if any very great advantage, either in economy, control or in any point, might be obtained by making that five per cent. ten per cent., it still would be quite an advantage. In other words, if the cost of the motors should be doubled, and we could get any decided advantage, the money would be well spent, and it would be well spent if we could even get rid of the lack of economy in the consumption of steam due to the variable cut-off incidental to rapidly changing loads that we have with the present system. Mr.

Mailloux touched upon this, and it is a thing which is quite important, because it is utterly impossible to use to-day engines of the highest economy, such as are used in other practice, for the reason that the supposed economy vanishes altogether in the use of compound engines, etc., because of the variable loads. The proposed system here certainly will tend to give an almost constant load in the central station and effect a very large economy by the possibility of using engines of the highest type and operating them at the most economical cut-off.

As regards the depreciation of machinery, which I find I have made a memorandum of, there is, apparently, three times as much depreciation in three machines as in one; but when two of those machines are placed out of the influences which are the principal cause of depreciation, and when the third one is in a condition such as to have a minimum of sparking, and a minimum of heating of its field, and when the motor generator portions are also under the best conditions as regards sparking, etc., such will not be the case. The fact is, that in practice the operation of the system shows that the machinery requires almost no attention. And I know of instances in which electric elevators, which, as Mr. Sprague has pointed out, represent the worst kind of street car service, have been in operation for three or four months at a time without the slightest attention of any kind whatever. They have self oiling bearings, and being entirely sparkless, they have had no attention whatever for months at a time.

The importance of a single lever, rather than a multiplicity of things to handle on a street car, has been touched upon both by Mr. Sprague and Mr. Mailloux in a rather forcible manner, and I call attention to the fact that in this system there would be but one lever which would accomplish all the changes of speed in either direction, and also apply the brakes, as the production of energy and the restoring of energy to the line is the braking action for the car, and under any normal use of the system no mechanical brakes of any kind would be used, and the instance cited by Mr. Sprague, of something on the track which makes reversal necessary, can be dealt with by this system with the greatest of ease and the utmost rapidity.

I judge by a comment of Mr. Sprague's that he imagines that the time element in getting under way by this system is far more than it really is in practice. The fact is, that having a separately excited field for the generator, there is no cumulative action in the excitation of its field, and the change of field of the generator, and consequently the speed of the motor is extremely rapid. With the ordinary type of even cast-iron fields the action is extremely rapid.

A point which may possibly be of interest, in view of the discussion of the application of the shunt motor at high speeds on a level, is not in the paper, but it is a possibility in this method. When we have reached the full speed of operation on a level, we can avoid the necessity of running at Dr. Hutchinson's 20 per cent. efficiency by changing over from 500 volts of our generator to the 500 volts represented by the trolley and the ground, by a movement of the switch without the least sparking, and without any difficulty; because in changing over we have the electromotive force of our propelling motor as before, and that will eliminate any inefficiency of the generator, and by operating as a shunt motor, especially on the trolley system, it would enable us to make long runs with an efficiency of probably 90 per cent.

As regards the question of efficiency again, Mr. Sprague mentioned the probability of 16 amperes being required for merely the excitation of the field to accomplish the regulation. I may say in this regard that a quite recent test within the past ten days shows that the entire amount of energy required at 230 volts—that is the system in this city—that the total number of amperes required, not only to excite the field, but to move the elevator at its lowest speed, is not 16 amperes but 8 amperes.

There is so many points of importance in the system which I called attention to in the paper which have not been touched upon, that I assume they are considered of some value. I am pleased to notice that the gentlemen agree that the objects in general are desirable, even if the method used is not the best of arriving at them; but it is one way of arriving at them and at present the only way, and the efficiency of that way can only, of course, be determined by practice.

The use of the system upon traveling cranes has gone sufficiently far to enable us to say that the efficiency of this method is very well known. There will be in use at the World's Fair a traveling crane, perhaps the largest ever constructed, which will operate by means of a motor generator between the source of supply and the final motors as the best modification of the method, although there are several others that might have been adopted. The use of this method on passenger elevators will shortly be tested thoroughly in the case of the *Herald* Building and the United Charities Building in this city, and in two or three other buildings about town, though some of them are private residences, where the apparatus would not be available for observation.

One of the best points in connection with the system, in my opinion, is the ability to restore energy to the line, in coming down grade or stopping, and what follows directly from that, the stopping of the car by an electric brake, which is not only an electric brake in the sense of being operated by electricity, but a brake which is an efficient means of stopping the car. It is the only brake I know of which will enable one to stop a car from its full speed down to a dead rest, and at all times during that period the application of the brake causes a positive saving on the system by the production of energy to assist in operating other devices. There are numerous modifications of this system, and, as you will notice, one good point is due to the fact that the secondary circuit has no connection with the line, which makes it possible to use any voltage desired in this circuit, and if in railway practice it became desirable to use a thousand volts for our trolley, we would still be able to use upon our commutators in the propelling motors 250 volts or 300 volts or 500 volts, or anything desired. We might make our motor such that it would run perhaps at ten miles an hour; we could switch over to the trolley line and continue running at ten miles an hour direct; then open our generator field, which would leave our generator with no voltage at its terminal; then we could insert it in the line between the trolley and the ground in series with the final motor, at a time when there would be no additional voltage by its introduction, and then, by raising the voltage with the generator again to 500, we have the means of securing a thousand volts on the motor armature and also securing a counter voltage of 500 to bring it to rest. A good many of these modifications will be of particular importance in certain applications. The principal point of importance, to my mind, is the flattening of the load diagram and what it accomplishes. That means, I believe, the cutting in two of the engine and dynamo, a very great increase in the economy of steam in the steam plant, especially in view of the energy restored to the line, which also assists in cutting down the capacity required in the station. This system will soon be tried on a street car. I was rather in the hopes that it would be in practical operation before this time, and had it not been for unexpected delays it would have been, and it will be now probably within the next six weeks, and when I have had the system in operation practically, under expert hands, certainly not prejudiced in its favor, I will be able to submit figures which are far more conclusive than those which I have assumed, and which may have errors in them. Of course, the method is totally independent of the figures I have submitted, and if those figures are inaccurate in any way the result will not be affected by them.

I do not think of any other points that I wish to mention.

Dr. Hutchinson: I have only a word further to say. I am glad Mr. Leonard does not feel discouraged; it shows his real expectations were not high. I must call his attention, though, to the fact that he has made a mistake in the statement that a large part of the 11¼ kilowatts is supplied from the line; the only part to be deducted is the excitation of the driving motor and generator fields; that is, a total of 310 watts—practically nothing. Everything else comes from the line motor. Taking his own efficiencies, this makes 21 horse-power in one case, and in the other, 11 horse-power.

About efficiency in general: Mr. Leonard takes efficiency of central station dynamos of fairly good size as a basis for the efficiency of street railway apparatus. This is no basis of comparison at all. It does not seem to me that any deduction can be made from one to the other.

Again, he did not answer the criticism that the equipment of a street car is determined not by the power for going up a five or six per cent. grade three miles an hour, but by the fact that the car must go on heavy grades at from six to nine miles per hour.

I think the plan is ingenious, and I have not the slightest doubt it will work—just as I might say storage batteries work.

Mr. Mailloux: I have only one question to ask Mr. Leonard. I am running cars with a storage battery which weighs seven and a half tons, or say seven tons, and I am compelled to run them up a five per cent. grade and carry 50 passengers, which would make a total weight not far from 12 tons. I would like to know what would be approximately the extra weight added to my car machinery, of which I already have enough on the car, by the converter—the motor dynamo of Mr. Leonard. It is evident it would have to be very much larger than that which he describes here. I should expect it to add at least as much weight as the storage battery itself.

Mr. Leonard: I did not quite understand the question. If I understood it correctly I would answer it by saying the method which I indicate, of using a motor generator and transmitting all of the energy to the final motor through it, would probably make it necessary to use a machine which would have a combined weight of about 120 pounds to each horse-power delivered. In other words, a motor generator, at its highest speed and special design, I have no doubt could be designed and built so that the combined weight would be about 120 pounds to the horse-power delivered. A motor generator would not, however, be used in the case of storage batteries.

Mr. Sprague: May I ask where Mr. Leonard proposes to put the power converter? I do not want to be too inquisitive about it.

Mr. Leonard: The question of location would be determined by the style of truck.

QUEEN NEW REFLECTING GALVANOMETER—(see page 205.)

It has been laid out to be placed between the axles of the cars, so that the axis of the motor generator would be parallel to the track.

Mr. Sprague: I thought if it was in that position it would not get the care and attention which is demanded for it. If it was placed in the car body, the cost of the space sacrificed for passengers would be somewhat more than the possible saving of such a system. But practical experiments determine more than all the arguments in the world. I think I am right in my prophecy that there will not be less pounds of coal consumed per car mile run by that than by the present system.

Mr. F. V. Henshaw: I would like to ask why it is that the motor end of the motor dynamo transformer is so much smaller than the rest of it—that is to say, about seven and a half kilowatt, against something like 20 or 21?

Mr. Leonard: The size of the motor for the line will be determined only by the power represented by the moving load—the size of the final motor and the generator must be determined by the torque at the time when the load is heaviest, and by the volts represented by the highest speed. But if you were to run your load at a low speed, comparatively, on the grades, and high speed on the levels, you would not have those two factors co-incident in the first motor.

Mr. T. C. Martin: The other item on the programme is the report presented by the Standard Wiring Committee and revised by the Committee on Units and Standards. I would like to offer a resolution that this report be now accepted, and referred to the Congress Committee, and transferred by it to its Sub-Committee on Provisional Programme for the Congress in Chicago in 1893. That, I think, will dispose of it in the only satisfactory way in which it can now be disposed of, and will give that committee and its sub-committee something definite to work upon. I would be glad to have the resolution seconded.—Carried.

The meeting then adjourned.

Dr. Werner Siemens and Jay Gould.

We are indebted to Dr. George H. Benjamin for the facts of a story which very prettily shows the distinctive difference in character between two prominent men, who, strange to say, died within a week of each other. One, a power in the financial world, and the other, a man who could put to good use in valuable improvements and inventions the money which the financial genius could make by means of his shrewdness and far-sightedness. Jay Gould, the wizard of Wall street, and Dr. Ernest Werner von Siemens, the inventor. The former was noted for his firmness; he was a man who said: "When a thing ought to be done, do it; let the consequences come." His fearlessness was evinced in the boldness of his enterprises, and his entire character is outlined in the dark lines of his success. The latter's integrity in business dealings and scientific achievements made him known the world over as a man of high principles and of inventive genius. Both will be remembered in history. Werner Siemens was one of four distinguished brothers, Ernest Werner, Sir William, Frederick and Karl. Sir William died about four years ago in London, and Frederick and Karl are the survivors. There are, we believe, other brothers, but these are the most famous.

Dr. Siemens was a Privy Councilor to the Emperor. We speak editorially of his other honors.

The story which we now relate was told to Dr. Benjamin, while in Berlin, by Dr. Siemens.

Jay Gould wanted a cable to be laid upon the bed of the Atlantic Ocean. He wanted to own one; why or wherefore, it matters not; he wanted to possess a cable and that was sufficient. With this in view he telegraphed to the agent of the celebrated firm of Siemens & Halske, in this city, saying he wished to see him. (Millionaires don't write letters when they own telegraph companies, they telegraph.) The agent very promptly presented himself at Mr. Gould's office and was requested to be seated. Awed in the presence of the great little man, he obeyed. Suddenly Mr. Gould turned toward the agent and said:

"You are the agent of Siemens & Halske, of Berlin? I want a cable laid across the Atlantic Ocean, and I want Siemens & Halske to make it. Have it ready as soon as possible, please."

When the agent had recovered from the shock, he managed to find breath to say: "Very well, Mr. Gould, we will be pleased to take your order. I shall cable to the firm and have the plans ready for you in a short time."

Mr. Gould turned his little bright eyes on the agent, and said:

"My dear man, I didn't ask for any plans. What I want is a cable. Oh! I see; I beg your pardon." Whereupon, Mr. Gould pressed a button and a clerk appeared.

"Mr. B——, just write out a cheque for $100,000 to the order of Siemens & Halske, of Berlin, and give it to this gentleman.—I suppose that will be enough to start with. Come in at the end of a week and let me know how the work is progressing. Good morning."

At the end of a week the agent again presented himself at the office.

"Mr. Gould, our engineers would be pleased to call upon you at your earliest convenience. They are prepared to submit their figures to you."

"My dear sir," protested Mr. Gould. "I told you before I didn't want any plans or figures. I know Dr. Siemens. I know the firm of Siemens & Halske, and I am sure that whatever the doctor undertakes he does thoroughly and to the best of his ability. I don't care about the price, go ahead and make the cable and bring the bill to me. But, perhaps."—and again, did Mr. Gould push the button, and again was a cheque for $100,000, payable to the order of Siemens & Halske, put into the hands of the astonished agent.

In quick time the cable was finished and laid, and is at the present day one of the best and most serviceable under the Atlantic Ocean.

Such was the handsome tribute paid to Werner Siemens by Jay Gould.

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THE OPINION OF AN AUTHORITY:

"The editorials appearing in ELECTRICAL REVIEW have been of untold value to all electrical enterprises."

A. M. YOUNG.

"Be sure you're right, then go ahead," is a good motto for builders of electric roads—long ones as well as short ones.

"A Thousand Miles by Telephone," as pictured in the REVIEW recently, has been much sought after by the daily and weekly press, and in its last issue that thoroughly wide-awake and always interesting monthly, the *Review of Reviews*, presents the illustration with encouraging comments on the advance in the field of telephone science. The quiet, unostentatious work that has been done by our telephone engineers during the past five or six years, it would seem, is now not only bearing fruit, and ripe fruit, but is receiving its just and proper recognition.

Christmas is coming! No better remembrance of the season to the younger generation can a fond father give than a year's subscription to the ELECTRICAL REVIEW. This may help to answer that ever-occurring question, "What shall I give?"

An electric light company sought an expert legal opinion upon an important point, and laid the matter before Senator Hoar and William M. Evarts. Each wrote an opinion, and each sent in a bill. It is stated that Mr. Hoar's bill was $50; Mr. Evarts', $10,000. It is not officially announced, but rumor has it that the opinions were very similar—except as to price.

Hon. John Russell Young, third vice-president of the New York Press Club, is a probable successor to the presidency of the Union League Club, of this city, a position long adorned by Hon. Chauncey M. Depew. We hope he will be elected. In honoring this able journalist and diplomat, the Union League Club, with all its great name, will only be honoring itself, and will extend its fame and influence in a new line.

We are pleased to republish the very interesting paper on "Electricity in the Art of War," written by Lieut. C. D. Parkhurst, Fourth Artillery, which appeared in the October issue of the *Journal of the United States Artillery*. In the present inferior condition of our defenses, the subject is one of national importance. This is a branch of electrical science that, in the hands of men like Lieutenant Parkhurst, may be developed, if proper governmental encouragement is given, to a high degree of value, and become a means of most efficient reference at a very low cost. We hope to see the question assume its proper prominence in Congress.

GIVE US BETTER ROADS.

We are glad to see that an organized effort is being made to agitate the subject of better roads throughout the country. Any one who has frequent occasion to use our public roads will be ready to testify unqualifiedly to the urgent necessity of some such movement. While we are not prepared to endorse an attempt to secure congressional interference with matters which are apparently outside of the bailiwick of the general government, and like the telegraph, telephone and railways, is a subject better fitted for corporation or even municipal enterprise, we do endorse lively agitation of the subject, with a view to driving home the conviction that roads should be improved and demonstrating the best engineering methods of accomplishing the result. The precedent already set in the establishment of an agricultural department of the government will require no stretching to cover a matter of such universal interest to the public as good roads.

CAR LIGHTING AND HEATING.

A comparative estimate, made by an English engineer, as to the cost of train lighting by gas, oil and electricity, indicates that oil varies from one to two cents per lamp per hour, compressed gas costs one cent per lamp per hour and electricity one-half cent per lamp per hour, while the cost of plant was about five per cent. less for electricity than for gas. This will be a welcome piece of news to railroad companies. The superiority of the electric light in giving more uniform illumination and not fouling the air commends it, irrespective of any question of expense. For heating, also, it will prove a competitor. When we consider the heat wasted in the chimney of stoves—the most common type of car heater—the lack of economy in electric heating assumes a less serious aspect than appears at first glance. A large saving is effected in developing the whole duty of the train from one furnace, and the electric heater expends all of its energy on the air to be heated, instead of imparting a small percentage to a metallic surface and sending the balance outside a car where it figures purely as waste. With steam heating the comparison would not be so favorable in cost, but convenience and safety would be strong factors in favor of electricity.

DR. ERNEST WERNER SIEMENS.

Dr. Siemens, the celebrated scientist, died at his home, in Berlin, December 6. He was born in 1816 at Lenthe, Hanover, and educated at the Lubeck gymnasium. He joined the Prussian artillery in 1834 and gained the rank of lieutenant in 1837. As a member of the Prussian general staff, he proposed, in 1847, the application of subterranean conductors, insulated with gutta percha, to the electric telegraph system. In 1848, with the assistance of Prof. Himly, he laid the first submarine mines for electric ignition, for the protection of the harbor of Kiel from the Danish fleet.

Dr. Siemens left the government service in 1850 and devoted himself entirely to science and private enterprises. As chief of the telegraph works of Siemens & Halske, in Berlin, he made that establishment one of the chief centers for the application of electricity to the industrial arts, and he afterwards opened branch works in London and St. Petersburg. Large works have recently been established in this country, at Chicago. The University of Berlin, in 1860, conferred on him the degree of Ph. D., and he joined the Academy of Sciences in 1874. Among his many inventions and scientific discoveries may be mentioned, the development of methods for testing underground and submarine cables, the invention of polarized relays, of the Siemens armature and dynamo electric machine, the pneumatic tube dispatch system, and the electric railway.

Dr. Siemens was a member of the Prussian Order of Merit, and Frederick III conferred upon him the patent of nobility. His lectures and papers upon various scientific subjects have been published and widely circulated in many of the best scientific journals.

We can truthfully say that the world has lost a useful man—the noblest work of God. Verily such a man was a power to move the world, for the condition of mankind is dependent on those separate factors in whom are self-invested the power of improvement. The history of a nation will no longer be a mere chronicle of monarchs and dynasties, but a record of its improvements, inventions and scientific discoveries.

He has earned an epitaph of which the greatest may be proud, for what can be better than a life devoted to the welfare of others. His was a serviceable life, and he left the world better than he found it. The public journals, and all the industries that he started, will bear evidence that under his tombstone lies the remains of a once useful man—one who benefited the world by being in it.

THE TROLLEY AND THE PIPES.

The present system of the overhead single trolley is experiencing new and unexpected difficulties which will take considerable experimenting to overcome.

It is claimed in Boston that the leakage from the currents has affected the gas and water pipes and the telephone cables.

In an interview with a representative of the Boston *Herald*, Inspector of Wires Chas. H. Morse states that there has been noticed a premature corrosion of water pipes.

It is believed that this is the result of electrolytic action, due to the escaping currents from the West End ground wires and tracks. As a result of induced currents, it was troublesome to locate grounds on the fire alarm system, and upon investigation it was discovered that the railway currents did not have a low enough resistance path upon which to return to the power station.

Constant complaints from the people in the neighborhood of the trolley line have been received at the office of the water board. They claim that the water pipes show leaks due to electrolytic action and consequent corrosion. In some cases, it is stated, when gas pipes have been connected in the act of relaying, etc., arcs have been common, in some cases igniting the hemp packing at the joints.

It would seem from these facts that one way of overcoming this difficulty would be the adoption of the double trolley system.

If this trouble is due to the leakage of the current, measures should be immediately taken to stop the waste and consequent alleged damage to the pipes, both to the advantage of the trolley company and owners of subterranean pipes and cables.

The subject is one which permits of considerable discussion and should not be dismissed without careful and scientific investigation.

CORRESPONDENCE.

OUR BOSTON LETTER.

The business of the Shawmut Fuse Wire has increased so rapidly of late that they have been obliged to seek more commodious quarters, and are now located at 161 High street. Their largely increased facilities enable them to fill orders promptly.

Mr. W. H. Francis, who was for some years connected with the old Edison General Electric Company, at one time occupying the position of assistant manager for the New England district, has recently joined forces with the Edison Illuminating Company, of this city.

The Worcester, Leicester and Spencer Street Railway Company, now operating an electric line between those cities, propose to extend their lines to other towns, and will soon petition for the right of way to Rochdale, and from there to Carleton City and Southbridge.

The Frank E. Fitts Manufacturing and Supply Company, of this city, have secured the New England agency for the "Hercules" motors and dynamos, and have fitted up their store corner of Oliver and Purchase streets with a complete plant, showing the machines in actual operation.

The Natick Electric Street Railway Company will petition the Legislature for permission to change its name to the South Middlesex Street Railroad Company, desiring to operate lines in Sherborn, Natick, Framingham, Ashland and Hopkinton, and to issue bonds and increase its capital stock.

E. C. Wilcox & Company, general electrical engineers, of Hartford, Conn., are building up an extensive business throughout New England. One of their latest installations was in the works of the Meriden Curtain Fixture Company, at Meriden, Conn., where they have put in a plant of 650 incandescent lights.

The Town of Wakefield, Mass., is very anxious to do its own lighting, and negotiations are on foot for the purchase of the plant of the Citizens' Gas and Electric Light Company, which furnishes current for lighting and power purposes to Wakefield, Reading, South Reading and Stoneham. The company want $200,000 for the plant.

Messrs. Waterhouse Brothers, the well-known inventors, of Hartford, Conn., are making preparations for pushing the sale of their new arc lamps extensively during the coming year. Mr. James N. Gamble has recently become associated with them in business, and the firm name has been changed to Waterhouse, Gamble & Company.

The New Grain Elevator of the Boston and Maine Railroad Company, at Mystic wharf, is to be lighted throughout by electricity. Incandescent lights will be used inside the building, and the surrounding grounds will be illuminated by arc lights. Apparatus for 850 incandescent and 50 arc lights has already been ordered, and the plant will probably be increased in the near future.

A Warm Discussion is now being carried on before the Board of Railroad Commissioners, between the Cambridge Storage Battery Electric Street Railway Company and the West End Street Railway Company, relative to the application of the former company for a charter to operate a line through the residence portion of Cambridge. The West End people are opposing the scheme vigorously, and the outcome is awaited by the public with considerable interest.

The Elektron Manufacturing Company, of Springfield, Mass., are branching out very extensively at the present time, and have just placed an agency for the coming year with Gannett & Company, Providence, R. I., and with R. H. Loomis, of 29 North Seventh street, Philadelphia, Pa. They will also shortly have a branch office in Boston. The sale of their motor generators for telephone and telegraph work is increasing rapidly, and they report the elevator business is also on the boom. H. G. T.

Boston, Dec. 10.

OUR CANADA LETTER.

Halifax, N. S.—Certain bondholders of the Halifax Street Railway have issued a writ of foreclosure in the Supreme Court for $225,000. The company claim that this is the revival of an old suit commenced two years ago, and is brought by holders of illegal bonds, which the company repudiates.

Toronto, Ont.—The Smith's Falls Electrical Power Company (Limited) has been incorporated by letters patent of the Province, with a capital of $60,000. The chief promoters are Messrs. F. T. Frost, William H. Frost, C. B. Frost, J. M. Clark, Adam Foster and Fred. A. Bethume, of Smith's Falls, Ont. The company proposes supplying electricity for light.

Hamilton, Ont.—The gentlemen who propose to take stock in the Hamilton Radial Railway Company have had a consultation with Engineer Jennings on the subject of the feasibility of the scheme to bring electrical power from Niagara to operate a system of electrical railways radiating from this city in the direction of Brantford, Guelph, Oakville, Mount Forest and Caledonia. After going over the matter thoroughly, Mr. Jennings gave it as his opinion that, until some better system of transmitting electrical power is invented, the scheme cannot be worked on a paying basis. The power can be transmitted, he says, but the plant would be so costly that it would not pay a dividend on the investment. Mr. Jennings added, however, that he had every confidence that a better system of transmission will be evolved at a very early date.

Montreal, Que.—The gross earnings of the Montreal Street Railway Company for the last three months are as follows: September, $72,686.82; October, $63,116.01; November, $52,293.05. Total, $189,095.88. The "best day" was September 20 (during the exhibition), when the receipts amounted to $4,224.28.—Letters patent have been issued under the Great Seal of Canada, bearing date November 24, 1892, incorporating Louis Perreault, printer; Honoré Beaugrand, journalist; Trefflé Berthiaume, journalist; E. M. Lovelace, merchant; J. O. Dupuir, merchant; Joseph Melangon, notary; J. A. Rodier, doctor; Alp. Raza, architect; Chas. Berger, contractor; James Cochrane, contractor; Ludger Consineau, contractor; Emmanuel St. Louis, contractor; J. R. W. Brunet, contractor, all of Montreal, for the following purposes, viz.: To furnish electric lights, motive power, heating apparatus, electric wires to transmit electricity in the city of Montreal and elsewhere in the Dominion of Canada, by the name of the "Central Electric Light Company, of Montreal" (Limited), with a total capital of $500,000.—The Back River Power Company is the name of an enterprise, the promoters of which are applying for incorporation, with the object of developing the water power upon the Back river, and to work the same, to supply the power to others and to do a general manufacturing and milling business, to construct electric roads, and to use electricity in all its forms and branches. J. A. C.

Montreal, Dec. 10.

PERSONAL.

Sylvester F. Eagan, of Buffalo, one of the principal stockholders in the Brush Electric Light Company, died last week at his residence in Main street.

Mr. Robert J. Parvin, the manager of the mechanical department of the S. H. Parvin's Sons Company, a well known and reliable advertising agency of Cincinnati, Ohio, paid the REVIEW a pleasant visit last week.

Mr. B. F. Lloyd, of Toledo, O., has taken charge as superintendent of the Central Union Telephone Company, of that city, to succeed Mr. M. J. Carney, who has resigned to accept service with the Chicago Telephone Company.

Mr. Allan V. Garratt, the former secretary of the National Electric Light Association, at present an electrical engineer in Spokane, Wash., has made an expert examination of the mammoth electric light plant in the Palace hotel in San Francisco. The hotel has the largest isolated lighting plant in the United States, there being 8,000 incandescent lamps. Mr. Garratt represents the purchaser in the final acceptance of the plant, which is just finished.

Quick Work by the Direct Cable Company.

The United Press, having occasion recently to send to the Central News, London, an inquiry relating to some ordinary business matter, filed a dispatch at the office of the Direct Cable Company in this city, and in exactly 10½ minutes afterward a reply was laid on the desk of General Manager Phillips. Quicker work than this, has, of course, often been done by not only the Direct Company, but by the other cable companies as well, but the foregoing record has seldom been equalled except when extraordinary effort to do so has been made.

The electric launch "Electra" was mentioned recently as making a run of 10 "miles." For miles substitute "hours," and this will give a better idea of the efficiency of the storage batteries in use on board. The Electric Launch and Navigation Company, 120 Broadway, N. Y., are doing good work in this field. They have found Tobin bronze of particular value for use in the propeller shaft, using this metal on the "Electra" and also on the beautiful launch "Corcyra," built by them for Mr. John Jacob Astor.

KIND WORDS FROM TEXAS.

A FRIEND OF MANY YEARS RISES IN THE SOUTH AND SPEAKS HIS MIND ON THE VALUE OF "ELECTRICAL REVIEW."

TO THE EDITOR OF ELECTRICAL REVIEW:

I notice you are getting many compliments on account of valuable features of the REVIEW which seem to especially commend themselves to your advertisers and those seeking information in the advertising columns. Such people no doubt know a good thing when they see it, but the great strides the REVIEW has taken in all departments in the past few years is a source of unbounded gratification to one who remembers its early struggles, when the field of its usefulness and influence was not quite so broad as at present. With the rapid development of the science of electricity, and its many applications in commercial and domestic life, the REVIEW seems to have kept abreast of it all, and gives its readers the very best of everything. Clean, vigorous, newsy and prosperous. All success to it!

FRANK B. KNIGHT.

Austin, Tex., Dec. 6.

Advantages of the Electric Elevator.

A great advantage of the electric elevator, which has now the endorsement and backing of the famed engineering house of Otis & Company, is that it can be placed wherever it is most convenient to the purposes of the architect. The motor and appliances can be put either on the roof, in the basement or in some intermediate spot. The idea of locating an elevator on the roof is a radical departure from existing elevator practice; but it has been found so effective in working that it will soon become customary, especially where there is a nest of elevators operated, and where the basement space is more valuable than that which would be occupied by the machine on the roof. Besides the absolute saving in space, this elevator renders other economies possible. The latest and most improved forms of this elevator are a way car with a capacity of 325 feet per minute with a live load of 2,500 pounds, and an express car having a capacity of 400 feet per minute with a load of 1,800 pounds. Another advantage gained by the use of this elevator is that it is impossible for any elevator boy to turn it into an instrument of torture, as its stop can be just as perfectly graduated as its start.

Proposed Dam Across the Housatonic.

A company with $1,000,000 capital has been formed to construct a dam across the Housatonic River, between Oxford and Monroe, or Newton, for the purpose of creating an immense water power, which, in turn, is to be used in the generation of electricity for power purposes at long distances. The company expects to do its principal business in manufactories to which it will supply power without difficulty and at a low cost. The cities of New Haven and Bridgeport are expected to prove profitable fields for the new company. The dam will be not less than 30 feet high. The application for a charter will be presented to the next legislature by Robert S. Hinman, of Oxford, Conn. The plan is modeled after the plant in operation in Frankfort, Germany, which has been in operation for 10 years, and where power has been transported 80 miles with a low percentage of loss.

Marriage of the Daughter of Captain George N. Stone.

A notable event in Cincinnati was the marriage of Miss Alice Maud Stone, daughter of Captain George N. Stone, the well-known manager of Cincinnati telephone interests, to Mr. Albert Alanson Cary, of New York. The groom is a prominent mechanical engineer, and has in readiness for his bride a pretty home in this city.

The floral decorations of Captain Stone's house were exquisite and the bridal procession was an array of youth and beauty. The presents were magnificent, among those being a chest of solid silver from the bride's parents.

LETTERS FROM A LABORATORY.—XXV.

BY JULIAN A. MOSES.

The fact that any number of particles of certain metals may be deposited from a solution upon any surface, in any quantity, and in any time, within certain limits, is, indeed, one to be wondered at. The remarkable conveniences that this process—that of electro-deposition—affords, should invite the practical operator in the laboratory to take advantage of it, to adapt it to his especial wants, and to make it serve him in many out. The brass plate over which the table is to slide must be flat. Four conical pins, shown in Fig. 2, should be driven into the ways. Reproductions of all kinds may be made, and with such exactness, that they out-distance all other attempts at duplication of models.

Copper, that metal so useful to the electrician, is the easiest of manipulation, and the deposition from its solution in sulphuric acid, copper sulphate, is so easily managed that remarkable pieces of work, that could not be done in any other way, may be satisfactorily accomplished. Numerous experiments with deposits of copper, about which I shall first speak, have shown that it may, in some cases, take the place of accurate fitting in mechanical movements.

The first interesting application will enable the mechanic to make a perfect "slide" with little labor. Fig. 1 shows a table which has parallel dovetail grooves cut into it. Suppose it is devised to make this table slide on rails in such a manner as to avoid all "slack motion," and thus obtain an even movement in one direction. If there are no mechanical means at hand to make these rails, the following process may be carried

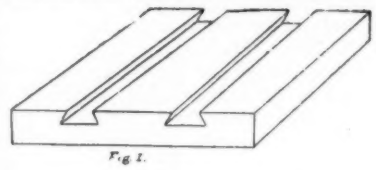


Fig. 1.

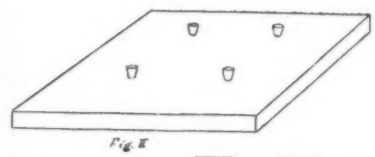


Fig. 2

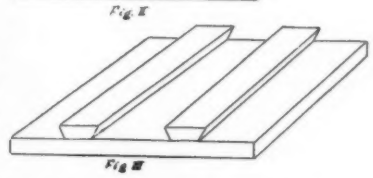


Fig. 3

plate in line with the middle of the grooves. These serve the purpose of holding the deposit more securely to the plate. Coat the inside of the grooves with a very thin varnish composed of gutta-percha dissolved in naphtha, and when this is almost dry, dust some powdered plumbago over it and gently brush it with a soft camel's hair pencil. All unnecessary plumbago will be removed and it will give a homogeneous conducting surface, independent of the brass underneath. The plate with the inserted pins should now be clamped in position, *i. e.*, with the pins projecting into the grooves. This may be accomplished by wrapping some stout cord around the two plates, all parts other than those covered with the plumbago, and that part of the plate immediately above the grooves must now be varnished with spirit varnish, and this allowed to dry. Attach a copper wire to the piece of work, so that the surface of plumbago is in electrical connection with the negative pole and put the whole into the copper-plating bath. Agitate the solution now and then so that fresh liquid may come in contact with the surface inside of the grooves. Use a large copper anode and when a layer of copper, say one-sixteenth of an inch in thickness, has been deposited, remove the work from the bath. Naturally, the pins have become thoroughly coated and form practically a part of the deposited copper. Place the entire piece of apparatus in naphtha and by capillary action the gutta-percha will be dissolved out. If it is difficult to separate the plates after dipping in naphtha, carefully dry them by allowing the naphtha to evaporate *spontaneously*, and when perfectly dry, gently heat the grooved plate. Before the other plate has had time to become hot, gently tap it with a piece of wood and they may now be easily separated. In case it is desired to fill up the holes left in the rails, melted lead may be poured in, first moistening the interior surface of the copper with acid zinc chloride. A little grinding with flour, emery and oil will make the slide much smoother. Fig. 3, shows the rails after they have been filled with lead.

ELECTRIC RAILWAY AND POWER NOTES.

Plainville, Conn., is to have an electric tramway to New Britain, Conn.

An electric street car line will be running by January 1 in Durango, Colo.

An electric sleigh is the result of the latest application of storage batteries for traction purposes.

The Brunswick, Me., Electric Railroad Company will apply for a re-enactment of its charter.

West Side street railway stock in Chicago has been carried above 200, and is now selling at about 207.

A syndicate from Scranton has purchased the Ithaca, N. Y., Electric Street Railway and electric lighting plant.

A project is on foot to dam the Leon river at Belton, Texas, to secure water to run an electric light and power plant.

The electric street railway between Lynn and Salem will soon be in operation. Cars will be run every half hour and the fare will be 10 cents.

The trolley cars in New Haven, Conn., have been greatly harassed and travel on the lines has been impeded by the heavy fall of snow.

The cars of the Johnston and Gloverville Street Railroad are being fitted out with electrical appliances by the Thomson-Houston Company.

The trolley line in Catherine and Bainbridge streets, Philadelphia, will soon be ready. It is expected that it will be completed before Christmas.

One of the new electric sweepers for Toronto will be in use by the beginning of next week. Recent trials have shown that good results are to be expected.

Work on the new electric railway between Laurel Grove and Little Falls is well under way and it is expected that it will be completed before severe winter sets in.

On December 1 bids were opened for the grading of the McKeesport and Wilmerding electric road, and it is expected it will be completed and cars running by next May.

A number of small launches are to be sent from the Lynn works to the World's Fair next year, to be used for small excursion parties. Their motive power will be supplied by means of storage batteries.

Mayor Stuart, of Philadelphia, signed the ordinances authorizing the use of the trolley system in West Philadelphia, by the Fairmount Park and Haddington and the Elmwood and Fairmount Park Passenger Railway Companies.

The Dundee Palace Electric Line, of Omaha, Neb., was levied on recently, on a judgment rendered in the case of the Merchants' National Bank, of Kansas City, against the Metropolitan Cable Railway Company, for $40,000.

The people of Youngstown, N. Y., are determined in their efforts to secure the completion of the Lewiston and Youngstown Electric Railroad, and have appointed a committee to go over the entire route and secure the right of way.

Some idea of the growth of the Thomson-Houston and General Electric Companies may be formed from the fact that there are at present 140 draughtsmen engaged at the Lynn works alone. Only a short time ago 100 men were employed in that department.

The General Electric Launch Company, Camden, New Jersey, capital, $300,000, has been formed to manufacture, use, buy, sell, etc., batteries, motors, switches, etc., for use in connection with the operations of the company. H. Weston, C. A. Senior, Jr., of New York, and W. R. Robins, Ozone Park, N. Y., are the promoters.

Ten cars to be run by storage batteries are now being built for the Second avenue line, in this city. The system adopted is different from all others, and the entire equipment, including batteries, motors and plant, will be manufactured by the Waddell Storage Battery Company. In the experiment made with this class of car at Chester, Pa., during the winter of 1891-92, the car ran 5,000 miles.

It is stated that the Thomson-Houston Company have obtained possession of a practical storage battery system for street railways. This system, it is asserted, reduces the cost of maintenance to less than that of any other storage system. The invention is that of a New York young man, and the price alleged to have been paid is $50,000. The system will probably be put into operation soon.

Suits have been brought in the United States Court, at Toledo, O., which involve every electric railway in the country. Benson Bidwell, of Rochester, Ind., claims that the present system in common use infringes his fundamental patents, covering the use, by 600 corporations, of the underspring contact, the running and lighting of cars by the same current of electricity and the illumination of streets and houses from the currents of the railway.

A syndicate of local and Boston capitalists are the projectors of a new line of street railway, to be operated by electricity, between Beverly and Gloucester, Mass. The incorporators are William H. Jordan, W. Frank Parsons and David S. Preston, of Gloucester, Henry W. Peabody, of Salem and Beverly, and Lamont G. Burnham, of Boston and Essex. This will be a continuous route by street railway from Gloucester to Boston, passing through some of the most picturesque scenery in the State.

Voting by Electricity.

Serious complications have arisen lately regarding the method now in vogue for voting. It has not been and is not now possible by the present system for the illiterate to vote intelligently, and as there is no practical means by which he can record his selection in words, many votes have gone astray and many a man's intentions have been directed in the wrong way.

The Greeks first used a shell or ball (hence the word "ballot"), and from this to the modern paper ballot was a vast and decidedly marked improvement. But this system is not by any means perfect. The ideal system must be such that by means of which "the voter who is not able to master a single idea beyond the name of the candidate for whom he wishes to vote," can go to the poles and record his choice in language that will admit of no misrepresentation. Evidently, the only secure means of recording speech is by means of the now greatly improved phonograph. We have not yet reached that stage, but we are not far from it. A mechanic, of Rochester, named Meyers, has perfected an automatic electrical voting machine applicable to the Australian method, which is, perhaps, destined to remove the only defects of that otherwise admirable system. It is simply a mechanical electrically controlled device for recording votes; all the voter needs is the name of the candidate whose election he desires, together with the ability to read, the power to distinguish color or the sense of touch. As everybody possesses at least one of these three latter requisites, it is safe to say that any man who knows for whom he wishes to vote can do so without the possibility of a mistake.

This ballot machine is a sheet steel booth five feet square and seven feet high. One foot of space is set off for the secret mechanical counters by a solid steel partition. The voter knows the standard designating color of his party ballot; he has examined the official nominations published in newspapers and on the chart at the poles. After qualifying, the voter enters the ballot machine. If the voter is illiterate he pushes in the knobs having the same color as his party ballot. Having done so he simply goes out of the exit doors. Opening the outer exit door returns the knobs in readiness for the next voter. When the polls close the count is all made and registered plainly in figures.

The first trial of this machine was made at Lockport, N. Y., and the way in which it superseded brains and watchfulness led to its almost immediate adoption in numerous sections of this State.

Electricity in the Art of War.

BY LIEUT. C. D. PARKHURST, U. S. A.

The locomotive whose movements are controlled by the click of the telegraph sounder, becomes thus as much an engine of war as the heaviest piece of modern ordnance. With steam and electricity we are able to effect concentration of men, supplies of food and munitions of war, and conduct operations upon a scale that may embrace a continent. The importance of the electric telegraph in war cannot be overestimated.

Franklin in 1751 described a method for firing gunpowder by electricity. Priestly in 1767 independently discovered a method. Torpedoes and submarine mines are as old as our Revolution, and we all know how important a branch torpedo service has become of the art of war.

Continual experiment from Franklin's and Priestley's time have advanced the art of exploding gunpowder or high explosives from the high tension or static spark of Franklin to the low tension platinum fuse of the present day, and has developed the battery or the hand exploder for this work. To-day we can count upon the certainty and efficiency of electric torpedoes as beyond a doubt, making them a terrible weapon of defense against a hostile fleet. So to electricity again we are indebted for this possibility.

With the constant development of improvement in the insulation of cables, the stability of high explosives and the general simplification of details, it may safely be assumed that the torpedo will be brought to a high state of efficiency, so as to be absolutely reliable even after long periods of immersion.

Passing the use of land torpedoes and their proper location and operation, and the use of high explosives electrically exploded, for the demolition of bridges, culverts, embankments, canals and railways, we come finally to the consideration of more advanced uses of electricity, bringing us to the dynamo and the necessary means for developing the current.

The discoveries of Davy and Faraday made the modern arc light a possibility. So long as the light depended, as it did in Davy's time, and until a comparatively short time ago, upon the galvanic cell for its generation, it was uncertain, costly and cumbersome. Yet, in spite of these disadvantages, the great advantages to be derived from its use were recognized as so great, that we find the French advocating its use as early as 1855. The French fleet in spite of all of the imperfections and cost of the battery, employed the arc lamp with a parabolic reflector to throw a beam of light upon the point of attack, in the campaign of the Baltic. Austria and Italy also experimented to the same end, showing the early importance that was attached to this aid in the operations of war.

It was not until the introduction of the dynamo, and that too in far from the present form, that much success was attained. About the first real success was during the Franco-Prussian war and under the walls of Paris. Here the French made use of it as a source of light and a means of telegraphic communication. They made use of an Alliance machine, long since antiquated and obsolete, and a Serin regulator, which, in spite of the defects of the reflector employed, allowed several movements of the enemy to be detected, and did good work in preventing several night surprises.

However unimportant these results may have been, they pointed out the way to the Germans, who immediately studied the new question. In 1873, at the Vienna Exposition, side by side, were to be seen French apparatus with the Gramme machine and projector from Sautter and Lemonnier, and similar apparatus from the workshops of Siemens, of Berlin.

From this time up to the present constant improvements have been made. The dynamo of 10 years ago is antiquated to-day. Improvements in lenses, in carbons and in lamp regulators have kept pace with those of the dynamo, so that now it is possible to have lights far superior to those above mentioned.

Our home electricians have also given thought and study to the subject, not in its military aspect so much as in its commercial, for want of any demand or encouragment. Yet search-lights have been developed for marine use, and it is now common for our merchant steamers, as well as our naval vessels, to be provided with powerful lights for night work.

Among the naval vessels fitted with search-lights of domestic manufacture are the "Yorktown," "Baltimore," "Charleston," "Miantinomoh," and "Philadelphia." Fitted with French lights are the "San Francisco," "Petrel," "Concord," "Bennington" and "Atlanta." Each new ship is fitted with the search-light as a matter of course as with any other vital part, the whole subject having advanced from the experimental stage to that of absolute certainty and necessity.

Besides this development for naval or maritime use, there has been a corresponding development for land purposes. The commercial arc light of to-day is not the flickering, hissing, sputtering, variable light of 10 years ago. The same lights that are available for the sea are also available for land use, and besides these, special portable outfits have been developed to accompany an army in the field.

"There is a demand at the present moment for more light; the demand comes to the front rank of military necessity for modern scientific warfare. Darkness, that bugbear of the tactician, that friend to night surprises, secret expeditions and the like, must no longer remain so. We must have darkness under control; in other words, having the means of readily and promptly lighting vast tracts of land or water to a brilliancy, only second to-day by means of the electric light, we can have darkness at will.

The importance of such a possibility would seem to be self evident. It is not my purpose, however, to elaborate this branch of the subject as pertaining to the army in the field, or to give its full tactical value and employment. It will suffice to call attention to the vast field that is open to the electrician and the tactician in this direction, and the probable use, in fact the almost indispensable necessity for its use for the following purposes:

First. The passage of rivers, including the building or repair of bridges for that purpose.

Second. The embarkation and debarkation of troops, both by land and by sea.

Third. The repair and construction of railroads in the field.

Fourth. The prevention of night surprises both to the army in the field, or in permanent or semi-permanent works.

Fifth. For the defense of field works or other inland fortifications undergoing a siege. To aid the directing of night fire, and to screen the works against the fire of the enemy.

Sixth. For the attack of field works and fortifications; to aid in night work in the trenches and to direct the fire of the attack. Meeting search-light with search-light.

Seventh. To assist in finding and succoring the wounded and in burying the dead after an engagement.

Eighth. For night signaling; for day signaling in cloudy weather when the heliograph cannot be used.

That the portable electric light outfit has its drawbacks as well as its advantages goes without saying. But that its advantages far outweigh its faults would seem beyond a doubt. Constant improvement in design and efficiency have produced the modern dynamo of light weight, slow speed and high efficiency for the special types needed for marine use. Corresponding improvement can reasonably be expected for the portable land outfit when any encouragement is given to our electricians, looking to their being a demand for his work. Already the weights have been reduced so that a complete machine, with engine and boiler, weighs but from 4,500 pounds to about three tons, depending upon the size of the dynamos and engine; the lighter outfit will furnish a current of 24 amperes and 45 volts at a moderate speed, requiring but about three horse power of energy. The same carriage carries the projector, a bobbin of double cable, and the indispensable necessities of the outfit, such as injector, main pump, tool chest, water-tank, etc., etc.

The heavier machine carries the dynamo, engine, boiler, coal and water upon one carriage, with projector, lamp, two drums of cable (double), each 100 metres long and other accessory apparatus, including a telephone for directing the light from a distance upon another carriage. These wagons weigh about three tons loaded. Each requires four horses. The projector can, if necessary, be dismounted and carried by hand to places inaccessible to the wagon. Steam can be got up in 20 minutes.

Pack mule outfits have also been made, no piece when dismounted weighing more than 220 pounds. The fact of so much pains having been taken in bringing out the mountain equipment shows the supreme importance assigned on the continent to the possession of search-lights on all occasions.

The portable search-light outfit has been most successfully used in manœuvres, and in the Egyptian campaign. It was also used in an African expedition in the gold fields. "All night long steam was kept up on the engine, and at intervals the powerful electric search-light sent its mysterious white beams of light into the dark woods beyond."

That the introduction of the dynamo and search-light for field army use will meet with decided opposition is beyond a doubt. The catapult, when first introduced, was received with disfavor; gunpowder was looked upon as an abomination by the chivalry of the middle ages; the percussion lock was condemned as utterly unreliable by the flint-lock champions; the breech-loader had to demonstrate its superiority before it was fully adopted; the use of the torpedo was characterized as barbaric; small caliber

rifles, smokeless powders, high powered ordinance and each and every improvement in the armament or equipment of armies have been combatted by the conservatism of nations.

But it is suicidal for a nation to go to war without taking advantage of every modern improvement that may aid, even in a remote degree, in the strife. Any new military invention that is neglected or ignored, places just that much less chance of success with the ignoring nation, and just that much greater chance with those which have more wisely adopted it. The Austrians fought side by side with the needle gun, and yet did not appreciate or adopt the same, much to their sorrow in 1866. In war with barbarous nations, which cannot obtain or adopt the modern appliances of civilized nations, the latter are bound in the end to win. This would in all probability be the case in a war between two European nations in which one was armed with magazine rifles, field mortars, smokeless powders, shells charged with new explosives, field watch towers, balloons, etc., etc., while the other commenced the campaign under the conditions which would have been regarded as normal 10 years ago.

But, however destructive and terrible in its proposed effects any such modern improvement or invention may be, it loses much of its significance when it is at the disposal of both contending parties. Consequently the best means of opposing, or more accurately speaking, of paralyzing the advantages which the possession of a new invention confers on one side, will be its adoption by the other.

It has always been recognized that one of the principal means of getting on even terms with an enemy, is to fight him with his own weapons. But contending with him on even terms would not in itself be sufficient to confer the probability of victory on our side. It is further necessary to investigate thoroughly the best means of taking advantage of the improvements referred to, and thus anticipating or preventing the enemy from obtaining the same results.

The above quotation applies most decidedly to the dynamo as an engine of war. Our enemy, whoever he may be, will be provided with the best that modern science can produce. In self-defense, if for no other reason, we must be likewise provided, and be ready and able to use it, as well as have it in our possession.

Leaving, therefore, the development and use of the portable outfit for general field use to those better qualified to discuss the subject, let us turn at once to a subject of vital importance to the artillery, the proper defense of our seacoasts, harbors and forts.

Here we must expect at once to come in contact with the electric light. Every nation with any war vessels at all has them equipped with search-lights as one of the vital and essential elements for successful attack, as well as for their own preservation and existence. Our navy have lights up to nearly 50,000 candle power upon its ships. It is not to be supposed that they are better off than all foreign navies.

(To be continued.)

How the Telephone is Managed in Roumania.

The two Roumanian cities, Galatz and Braila, on the Danube, were lately connected by telephone, which is, like the telegraph in that country, an institution of the State. Before its opening, an ordinance of the government for its use was published in the official gazette, the principal part of which is as follows:

"A person who wishes to communicate with another by telephone is bound to notify that person beforehand by letter, telegraph or otherwise."

A dealer in produce in Braila was about to close a contract for a supply of barley. He desired, however, to learn beforehand the price of barley quoted at the Board of Trade in Galatz. For that purpose he went to the telephone office, and, after paying the fee, desired to get telephone connection with his correspondent in Galatz.

"Very well; have you informed that gentleman?"

"What for? He is in Galatz, and the person to whom I want to telephone."

"That would not do, sir. Here is the ordinance. Before you can telephone to him, you must inform him beforehand by letter, telegraph or in any other way."

"Nonsense! Is the government crazy? Maybe they ask me to travel to Galatz and inform him that on a certain day and hour he may be at the telephone office to receive a communication from me?"

"Yes, that would do, too," the official said.

The merchant was obliged to give up his barley deal.

Queen's Dead-Beat Reflecting Galvanometer.

The instrument illustrated on page 201 is a modification of the Wiedemann galvanometer, and is adapted for both differential and direct work.

The coils (*a*) are graded, having five changes of wire, and slip upon copper rods forming part of the damper.

Automatic connections are made with the binding posts on the switchboard (C) by means of small spring contacts upon the back of the board which press against platinized studs attached to the coils.

By shifting plugs on the switchboard the coils may be quickly connected in series, multiple or differentially. To obtain perfect differential adjustment a horizontal movement of the coils is secured by turning the micrometer screw (S).

The vertical tube is 24 inches long. The suspension being quartz fibre, instead of cocoon silk, torsion is practically eliminated, while great tensile strength is secured.

An essential feature of the apparatus is the arrangement of control magnet employed. In place of the usual single piece with the suspension tube passing through it, the magnet is divided into two parts, each of half the usual cross section, as illustrated.

The advantage of the construction is that, should it be necessary to make very delicate observations in the vicinity of the instrument, the magnets may be temporarily removed without disturbing any adjustments, and then replaced in exactly the same position.

Owing to the mass of copper in which the magnetic system moves, the galvanometer is almost absolutely dead beat, and observations may be taken in rapid succession.

This apparatus is of recent design and placed on the market by Queen & Company, Philadelphia, from whom further particulars can be obtained.

A Novel Entertainment.

A rather unique electrical entertainment was recently given in Rutland, Vt.

Part first consisted of an illustrated lecture on Practical Electricity, by M. J. Francisco, president of the Rutland Electric Light Company. In a novel manner, the lecturer presented different phenomena and artistic groupings of electric lights to which effects he gave the following names: Emblematic Banner, Search-Light, Midnight Photography, The Bridal Veil Fountain, Wizard Circle, Bewitched Star, Electric Coffee, Magic Flowers, Geometric Wheel, Candelabra, Spiral, Whirlwind, Electra's Arch, Electric Cooking, etc.

Part second consisted of a dance called "The Electra Dance," in which numerous little girls flitted to and fro with vari-colored electric lamps. The stage was prettily decorated with fir trees and red, white and blue incandescent lamps hidden in every branch. The entertainment was given for the benefit of the Rutland Free Library.

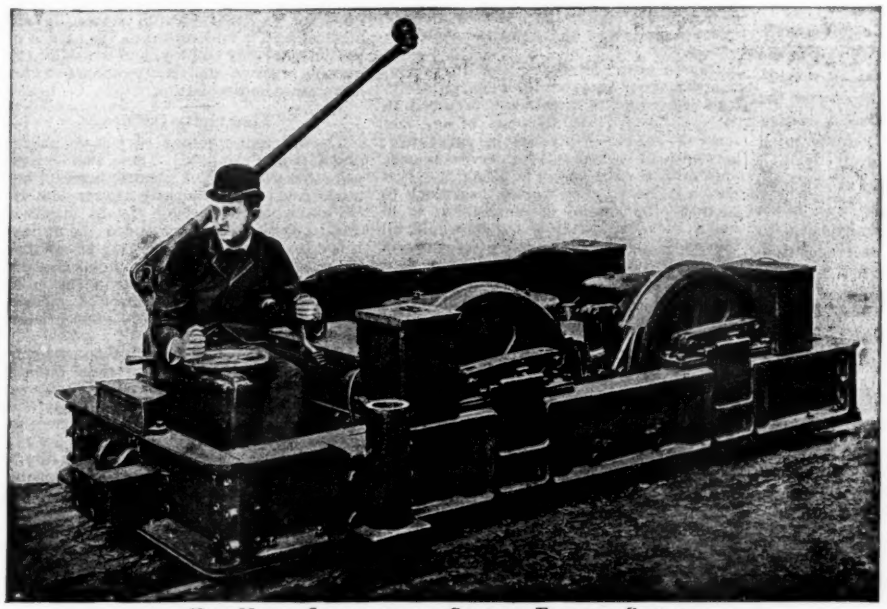
Improved Mining Locomotive.

We illustrated and described recently a new mining locomotive constructed by the General Electric Company—the C. L. M. type. We now show a new mining locomotive also designed by them to meet the growing demand for small substantial low priced machines of this character. It will be known to the trade as the T. M. M. type, and consists principally of two standard railway motors, mounted upon a heavy iron truck frame.

The truck frame is built of cast iron side frames, bolted to heavy steel channel beams, which are securely fastened together by a wrought iron angle plate. The axle bearing boxes are small and solid in construction, easy of access for oiling and replacing the brass linings. The frame of the locomotive is hung from the axle boxes by means of steel springs, so that there is little pounding upon the track. By this method of construction it is possible to take the motors, together with the wheels and axles, entirely out of the frame. The motors used are of the standard railway type, either the W. P. 30 or W. P. 50, as required. For gauges narrower than three feet special four pole motors have been designed, which will run on gauges as narrow as 18 inches.

The controlling mechanism used is the standard series parallel controller. The brake is a powerful form of steel screw and lever. No adjustment is necessary for the wear of the brakes used, as the steel screw takes up the lost motion until the shoes are worn out. The trolley is of the single arm insulated type, and may be moved from one side to the other of the machine, as occasion may require.

As the motors are self-protected, no cover for the locomotive is considered necessary, but one can be easily supplied. The cover increases the total height of the machine four inches. Sand boxes are provided for both front and rear wheels. All of the controlling levers are placed on the platform of the machine, within easy reach of the operator.



NEW MINING LOCOMOTIVE OF GENERAL ELECTRIC COMPANY.

At a well attended meeting at the Manufacturers' Club, in Philadelphia, Mr. Martindale, chairman of the telephone committee, in his report, referred to the Bell Telephone Company's equalization of rates, and added: "Your committee feels that the next six months will witness some stirring developments in telephonic business, and as it may be necessary to carry the contest for lower rates into the legislature, we would be pleased to have every paid subscriber of the Bell Telephone Company a member of the League to increase our working strength and force, so that it may not be unreasonable to hope that in the future we may have a perfect service at a reasonable, uniform rate of tolls for the whole city."

TELEPHONE CHAT.

Beverly, Mass., is to have a telephone exchange.

The Erie Telephone Company will soon arrange for a transfer office in Boston.

A new telephone line is being built to connect Paterson with Boonton, N. J.

It is probable that the city of Fresno, Cal., will have telephone connection with San Francisco.

The telephone rates between Lincoln and Nebraska City, and Lincoln and Omaha, have been advanced.

The towns of South Union, East Union, West Camden and South Hope, Mass., have conection by telephones.

A telephone line has been erected joining Ainsworth and Nelson, Wash., at which latter place the telegraph connects with the outside world.

There was a large delegation of telephone men in Birmingham, Conn., last week who went to examine and inspect the new telephone exchange.

Monticello, Cal., for the first time in its history, is in direct communication with the outside world, a telephone line having been built from that town to Winters, Cal.

Honolulu is said to possess one of the best telephone systems in the world, almost every dwelling house being supplied with an instrument at a cost of $16 per year.

I. J. Lerch, of Reading, has been appointed superintendent of the Pennsylvania Telephone Company for the eastern district of Pennsylvania, with headquarters in Allentown.

The word "Hello" has been declared obsolete in offices of the telephone company in Norfolk, Neb., and hereafter when the operator receives a call the subscriber will be quickly asked, "What number?"

The new telephone line from Rockland to Union, Me., was opened to the public last Friday. This line opens up a section of the country which has neither rail nor water communication, and where, as yet, telegraph lines are unknown.

Much trouble is being experienced in establishing a telephone line from Alpena to Middle Island, Mich., owing to the rocky condition of the country. It has been found necessary to blast all holes for the poles in order to plant them at the required depth.

The New York and New Jersey Telephone Company have been putting in long distance telephones in all the signal towns along the line of the New Jersey Central. It is believed that this move indicates that the company is preparing to lock horns with the Order of Railroad Telegraphers, and that in case of a strike the telephones will be utilized to help the company out in handling trains.

C. C. Jennings, formerly superintendent of the Brush Electric Light Company, of Buffalo, has patented a system of telephonic communication by means of which barbed wire fences can be utilized between railroad stations, farmers' houses and large ranches. The patent involves the use of a portable transmitter or telephone, which can be attached to the barbed wire at any point, and by which messages can be received or sent to railroad stations or other places at which there are regular telephones.

Evidence was recently taken in Ottawa, Ill., in the case of Mrs. Harper *vs.* the Telephone Company. Mrs. Harper claims $1,000 for injuries which she alleges to have sustained by falling over an excavation made by the telephone employés. It would be well for all workmen who are engaged in excavating to observe extra care in protecting unobserving and careless pedestrians from accidents which are liable to happen through the carelessness of workmen in not putting guard rails around the trenches.

MEDICAL ELECTRICITY.

EDITED BY DR. J. MOUNT BLEYER, NEW YORK.

Transactions of the American Electro-Therapeutical Association.

SECOND ANNUAL MEETING, HELD AT THE ACADEMY OF MEDICINE, OCTOBER 5 AND 6, 1892.

Electrolysis in the Treatment of Goitre.

Dr. Herdman, in the discussion before the society, said that, in considering any form of treatment of goitre, one must bear in mind the great differences existing in the various stages of the disease. There are ordinarily three stages—(1) where there is a simple dilatation of the vascular structures; (2) a stage in which there is the formation of cysts; and (3) a fibrous condition due to an increase in the connective tissue sub-stroma. The cystic form is identical with the condition existing in hydrocele, and as in the latter condition, injections of such irritants as carbolic acid or iodine yield better results than electrolysis; but the fibrous form is exceedingly refractory to internal treatment, and to most other methods, except the electrical treatment. The treatment is quite tedious, but it is possible by electrolytic action to secure absorption; and at any rate, better results are obtained than by any other known method of treatment.

Dr. Kellogg agreed with the last speaker as to the limitations of electrolysis in the treatment of goitre, but it must be remembered that some patients will choose the electrical treatment rather than a cutting operation, even though the latter is much more likely to prove successful. He had been pleased with the method of injecting the cyst with a saturated solution of iodide of potassium, and then submitting it to electrolysis. The resulting decomposition, with the evolution of nascent iodine, had a salutary effect on the lining membrane of the cyst.

Dr. Herdman remarked that he had also had satisfactory results with this treatment, but he had not been able to satisfy himself about the occurrence of this decomposition.

Dr. Kellogg replied that he knew that such a decomposition occurred, for, in the electrolysis of fibroid tumors of the uterus, on withdrawing the intra-uterine electrode, it was found deeply stained with iodine.

The President said that the frequent reports of successes in the treatment of goitre by electricity had led him to try this method, but the results obtained have given him reason for thinking that many confounded a symptomatic recovery with an organic change in the goitre. The great obstacle to success was our imperfect knowledge of the pathology of the condition. As goitre is associated with exophthalmos and with rapid action of the heart, we have long looked to the sympathetic nervous system for the cause. Erb has pointed out that the condition in these cases is often one of neurasthenia, and, more recently, we have been told that the changes observed are due to changes in the restiform bodies. He was now trying to follow out this idea, by applying the negative pole at the base of the brain and the positive pole at the forehead, hoping in this way to secure an effect upon the restiform bodies. Most of his cases had been treated by electro-puncture, preceded by electro-cocaine anæsthesia, using insulated platinum needles and an indifferent electrode on the back of the neck. He had also tried long static sparks. As a rule, he had noted that the treatment was followed after one or two months by a diminution in the swelling of the neck and in the exophthalmos, with a reduction in the rapidity of the heart's action, but he had seen no *remarkable* diminution in the size of the goitre. To Gautier was due the credit of introducing the electro-chemical method already referred to by the other speakers.

Dr. Goelet remarked that Gautier's results, particularly in the treatment of endometritis by this method, and in diseased conditions of the female urethra, had been very satisfactory.

Dr. Walker said that he could recall numerous cases in which he had found electrolysis a most successful method of treating fibrous goitres. The cystic forms, like oedematous fibroids, did not come within the range of electrical treatment. He first molded a tin electrode to the shape of the enlargement of the neck, filled it in with clay, and covered it with two thicknesses of cheese-cloth. The indifferent electrode was a large pad covered with absorbent cotton, and was placed between the shoulders. An assistant kept it constantly wet with a solution of bicarbonate of soda. Not the slightest discomfort was experienced from using a current of 100 to 120 milliamperes, for 10 or 12 minutes at a time, and repeated three times a week. In the case of two adults, the goitre had existed since childhood.

Dr. Herdman said he would be doubtful of a given tumor being fibrous, if it were of comparatively short duration, for fibrous changes develop slowly. The President had spoken of exophthalmic goitre, which is a very different condition from cystic goitre. He had never failed to cure a case of exophthalmic goitre, yet he had treated some very severe cases. He believed exophthalmic goitre to be due to an irritation of the nerve centers controlling the circulation at the heart, and, as a result of this irritation, contraction of Müller's muscle at the back of the eye is produced, giving rise to the exophthalmos. In accordance with this view of its pathology, he employed "the reversed continuous current," with the positive pole over the tumor and the negative one over the cervical enlargement of the spinal cord. He had tried all forms of the induced and continuous currents, but had had better and quicker results from the method described.

The President said that he had also found the electrical treatment of exophthalmic goitre uniformly successful, but had never seen any reduction in the size of the fibroid enlargements, although the associated exophthalmos and the anæmia would be relieved.

Dr. Dickson, in closing the discussion, said that those cases which were, probably, least amenable to treatment occurred in girls of from 14 to 16 years of age, and these should on no account be punctured; galvanism of the sympathetic nerve was more appropriate. His object in filling the cyst with a saline solution was not so much to produce any special decomposition, as to make use of an electrode which would fill the whole cavity, and so bring all parts in direct contact with it.

"Medical Electricity From an Electrician's Standpoint."

BY JOHN J. CARTY, VICE-PRESIDENT OF THE NEW YORK ELECTRICAL SOCIETY, ELECTRICIAN OF THE METROPOLITAN TELEPHONE COMPANY.

The author said that physicians, in speaking of the medical uses of electricity, employ terms which puzzle the electricians. He had asked, in turn, ten men, holding the degree of "electrical engineer, what was meant by the terms faradism, franklinism and galvanism, and not one of them could correctly answer the question, although all of them were familiar with the works of Faraday, Franklin and Galvani. The use of these terms had led many people to believe that there are three different *kinds* of electricity, which is not true; the difference between the three *isms* is only one of degree. These relics of a former age should be cast aside. The so-called faradic current is an alternating current; the galvanic current is "constant" as regards the voltage and amperage; while the franklinic current is a question of volts, amperes and interruptions. When an alternating current is passed through an iron wire, the resistance of this wire increases rapidly owing to self-induction, but if a copper wire be used, the resistance remains the same. If a condenser be placed in the circuit of a 1,000 volt direct current, it will prevent the passage of the current, but if placed in the circuit of an alternating current, the full current will pass through; hence, the alternating current acts in a paradoxical manner. The resistance of any inorganic body, speaking broadly, is different with every degree and form of the current. The human body in some portions may possess high self-induction, and in others, obey the ordinary law of conductivity, and in still others, act like a condenser. The author then dwelt upon the electro-magnetic theory of light, and the intimate relation of light to electricity. In concluding his paper, he referred to Tesla's recent and very remarkable researches.

DISCUSSION ON MR. CARTY'S PAPER.

In answer to various questions regarding the nature of the alternating currents, the polarity of the medical induction apparatus, and the possibility of obtaining more exact knowledge concerning the nature at any given time of the currents employed in medicine, Mr. Carty said that the alternating current changes its polarity, but not necessarily any particular times per second. There is an interruption in the current from an ordinary medical induction apparatus, but this does not necessarily coincide with the interruptions of the vibrator. By calling to our aid the graphic method, one could obtain tracings which would indicate the exact nature of any current at the time the tracing was taken.

Both Dr. Herdman and Dr. Kellogg had noticed some very peculiar physiological effects from the alternating current, and the latter gentleman said that he had made some tracings which showed the current to be a true sinusoidal current.

The President said that he had endeavored to overcome in a measure the uncertainties arising from our faulty nomenclature, by representing the different currents in the form of electrical prescriptions. For example:

R Milliamperes, *nil* (practically).
Volts, say, 100,000 (or more).
Interruptions, 1,000,000 per second.

Such a prescription would represent no other form of current than the static.

R Milliamperes, 500.
Volts, 30.
Interruptions, *nil*.

This would represent a constant or galvanic current.

R Milliamperes, $\frac{1}{10}$.
Volts, 500.
Interruptions, 200 per second.

This represents a faradic current.

Mr. Carty, in closing, said that he considered the use of these so-called prescriptions for electricity would materially aid medical-men in understanding the nature of the currents they employ, and it was an important practical step in the direction of a more exact nomenclature.

Electricity Defined.

The different opinions vary as the shades of colors of a rainbow. These also existed as to the *rationalé* of electric agency, but modern science confidently asserts that the old idea of electricity as a *"fluid"* has been *exchanged* by the well-grounded theory that it is a latent energy which may at any time be called into action by either chemical or mechanical means, thus creating in the molecules of matter a modification of motion, which for simplicity has been appropriately termed an "electric current."

The production of electrical phenomena may be brought about in three distinct forms: Static electricity, or *electricity in rest*, and producible by frictional excitation; galvanic electricity, or the *constant current*, generated by chemical action, and possessing important chemical properties; faradic electricity, or *electricity induction* of secondary currents in an adjacent conducting body, by the action of the primary galvanic current or of powerful agents. BLEYER.

An Engagement–Telephone Ring.

(*From Joe Kerr's "Jests, Jinglings and Jottings."*)

Ring on, O telephone; ring, O ring!
You noisy, teasing, hateful thing;
O, I shan't answer if you burst;
So strain and strangle—do your worst.
What? Ringing yet? You will not stop?
O, I am tired enough to drop,
And there is not a servant near
You wiry thing of tongues so queer.
You won't be still? I wonder who
The idiot is that's ringing you!
Well, well, what is it? Cut it short!
Huh! What? The milkman? Not a quart!
O, *not* the milkman. Who wants us?
(Say, Central, can't you stop that fuss?)
Yes, yes—go on—go *on*, I say!
D'ye want to keep me here all day?
Hello! Hello!! Say, who *is* that?
Your voice sounds like a squalling cat.
Eh? O, forgive me! (My! It's John!
If he would see what I've got on!
But still he won't catch on, I guess.
The telephone makes that old thing true
About distance and a person's view.)
Is that you, John? Go on, John, dear!
Your voice comes just as sweet and clear
As music from some angel's harp—
I suppose mine sounds a trifle sharp—
No! Doesn't it? You call it sweet?
What's that? That noise? That's my heart's beat
At your remark, you naughty man;
I'm blushing just as hard's I can.
What's that? You see me thro' the wire?
(*Heaven forbid! I shall expire!*)
I'm what? A bouquet of delight?
(O, misery! O, bless his sight!)
You catch the fragrance of my hair.
(I'm glad I'm here and he is there!)
My cheeks are roses and their dimples cups
From which young Cupid honey sups.
Why, John! What mean you? Don't you know—
(What *is* it, Central? Through? No! No!!)
Oh, do go on, John! What? My eyes
Are floral tributes from the skies?
My Dresden-china neck a vase
Which holds a dainty bouquet face?
O, John, come nearer! See! I swoon!
Your words come as some heaven-born tune
That thrills my soul and robs my life
Of—eh? What's that? *I* be your wife?
O, John! Come closer! That's right, dear!
Stretch out your lips; make large your ear!
No listen for a sound like this.
What is it? Our engagement kiss.
What? You would further osculate?
Come down to-night at half-past eight.
Heigho! The telephone's the thing
That gives me an engagement ring.

IN MEMORIAM.

DR. WERNER VON SIEMENS.

TO THE EDITOR OF ELECTRICAL REVIEW:

Dr. Werner von Siemens, the Nestor of German science, died at Berlin the 6th instant. He had been suffering with pneumonia for some time, yet the attending physician did not believe that the disease would be fatal. The sudden death of Dr. Siemens is a severe loss to the entire scientific world, and more especially to Germany. There has rarely been found in a single individual such a universal knowledge of all branches of science as the deceased commanded.

Werner von Siemens was the oldest and most famous of his nine brothers. His father, F. E. Siemens, followed the calling of a landed proprietor, residing on his farm at Leuther, near Hanover. Dr. Werner von Siemens was born the 13th of September, 1816. After an uneventful home life, he entered the Gymnasium (High School) at Lubeck, but soon left that school in order to take up his favorite study—mathematics. He went to Magdeburg, where he remained in the German artillery service until 1838, receiving a lieutenancy. In 1841, he took out his first patent on a galvanoplastic method, while at the same time he constructed a differential regulator for steam engines. Three years later the government sent him to Berlin to supervise the manufacture of ordnance. It was there that he commenced to take up the study of electro-magnetic telegraphy, which resulted in his being made a member (1847) of the Prussian Committee on the Introduction of the Telegraph.

The same year brought forth his printing telegraph, constructed on the principle of Neef's hammer; also a machine to be used for the covering of conductors with guttapercha. In 1848, he laid for the first time a submarine mine in the harbor of the city of Kiel to be exploded by electricity.

During the winter of 1848–9, by order of the Prussian Government, he constructed the subterranean telegraph lines between Berlin, Frankfurt and Aachen. Being tired of the active life of an officer, he quitted the army and, together with Halske, commenced the building up of the great establishment which is now known throughout the civilized world. It became the cradle and center of German electrical discoveries, methods of testing and constructing scientific apparatus, which are far too numerous to be mentioned in a synopsis of Siemens' manufacturing career.

In recent years the deceased had given much time and thought to the improvement of dynamos, electric light apparatus and lamps. Under his supervision the best photometers, using selenium, were constructed. To gain an idea of the work performed by the firm of Siemens & Halske, it may be mentioned that they constructed the entire North German telegraph lines (1849) and the Russian telegraph lines (1853).

When Halske, in 1867, severed his connection with Dr. V. Siemens, the brothers Wilhelm and Karl Siemens entered as partners. It was decided that they should assume the control of the English firm in London and Woolwich, which latter manufactured six of the now existing transatlantic cables.

At the fiftieth anniversary of the University of Berlin (1860), he received the title of doctor; in 1874 he was chosen a member of the Academy of Sciences, and in 1886, at the celebration of the five-hundredth anniversary of the University of Heidelberg, he received the degree of *Doctor Medicinæ, honoris causa*.

In 1878 Siemens studied the eruptions of Mount Vesuvius, whence he developed a new theory bearing upon observed volcanic phenomena. Again his work concerning the energy of the sun and its influence upon terrestrial electrical and magnetical phenomena ranks as one of the foremost contributions to modern science. Not less famous are his meteorological observations.

At the fifty-ninth meeting of the German Naturalists, he, for the first time, as far as we know, pointed out the scientific possibility to produce food by means of electricity. His spirit of liberality is well shown by his donation of 500,000 marks for the erection of a Physico-Chemical Institution, which was commenced in 1887.

Werner von Siemens was an honorary member of the British Association, first president of the Elektro-Technische Verein, Berlin, also a member of numerous other scientific societies and academies. In 1885 the government decorated him with the *Ordre pour le mérite*.

V. M. B.,
Member of the Elektro-Verein, Berlin.
Boston, Dec. 10.

ADVANCE INFORMATION.

New Electric Companies Formed and Important Constructions Projected.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week:

New Electric Railways.

MONTEREY, CAL.—A most important railroad transfer was consummated in this city recently, by which the Monterey and Pacific Road Street Railway was sold to the Carnall-Hopkins Company, of San Francisco, who will make it an electric line.

ITHACA, N. Y.—A syndicate from Scranton, Pa., has completed the purchase of the electric street railway and electric light companies' stock. The two corporations are to be continued with the same officers and directors in both.

ST. PAUL, MINN.—It is reported that Henry Villard will reorganize the St. Paul Electric Light and Power Company, and, with an increased capital, will carry out his scheme of making a practical test for an electric railway between St. Paul and Minneapolis. The cars are to run on Northern Pacific tracks.

NORWALK, OHIO.—The Sandusky, Huron, Milan and Norwalk Electric Road is an assured fact. The stock has been subscribed and the work of grading commenced.

FORT LEE, N. J.—Residents of Fort Lee and the neighboring villages of Pleasant Valley, Coytesville and Leonia will benefit shortly by the introduction of an electric railway.

MERIDEN, CONN.—The charter for an electric road between Middletown and Meriden is likely to be asked of the legislature.

ORANGE, N. J.—Watson Whittlesey is at the head of a scheme to build an electric railway to connect Orange with Montclair.

BROOKLYN, N. Y.—The Brooklyn City Railroad Company, which is now engaged in changing its 200 miles of road from horse cars to the modern electric trolley cars, is about to establish another line through Newtown to Bowery Beach.

MECHANICSVILLE, N. Y.—The purchase of the controlling interest in the Stillwater and Mechanicsville Street Railway Company, and the change of its motive power from horses to electric motors, is said to be the forerunner of a scheme to extend the Troy City Railway from Troy to Lake George.

LOCKPORT, N. Y.—The Lock City Electric Railroad Company has been granted a franchise.

VICKSBURG, MISS.—A charter for an electric street railroad and lighting company is now being applied for by responsible residents of the city, who are backed by western capitalists.

WAVERLY, N. J.—The Interstate Traction Company has been incorporated at Albany with a capital stock of $20,000. It will build an electric railway from Waverly to the Pennsylvania State line. Merle Wightman, James H. Torrey and others, of Scranton, Pa., are directors.

PORT HURON, MICH.—W. L. Jenks and E. Schoolcraft have secured a franchise for the right of way for a new electric railway.

MAYTOWN, PA.—The Maytown and Marietta Electric Street Railway Company; capital, $24,000. Incorporators, D. B. Case, John Malone and Thomas F. Grady.

MILLVILLE, N. J.—Council has granted permission to the Millville Rapid Transit Company to lay tracks and operate a trolley railroad.

CHICAGO, ILL.—The Calumet Electric Street Railway Company has executed a trust deed to secure an issue of six per cent. 20-year bonds to the amount of $1,000,000, to be expended in extensions and improvements.

NEW ORLEANS, LA.—A New York syndicate, represented by J. W. Seligman & Company, has purchased the entire street railway system of this city. The lines will be consolidated and the motive power changed to electricity.

GLASTONBURY, CONN.—It is expected that this town will have a continuation of its present electric road.

WALTHAM, MASS.—Prominent capitalists of this city propose to build an electric car manufactory; capital, $20,000, about one-half of which is already pledged.

HARTFORD, CONN.—The legislature is to be petitioned for increase of capital of the Hartford and Wethersfield Horse Railroad Company from $200,000 to $1,000,000, and for leave to extend its lines to Windsor, South Windsor, Cedar Hill and other points.

HUMMELSTOWN, PA.—The residents of this town expect to be connected by electric railway with Middletown, Pa.

Electric Light and Power.

DES MOINES, IA.—The Des Moines Water Power Company's electric light plants have been destroyed by fire. The plants will value at about $90,000, with $85,000 insurance.

ALLENTOWN, PA.—The Allentown Electric Light and Power Company proposes to erect an auxiliary plant to its present station.

MADISON, WIS.—The electric light company will rebuild its entire electric light system here.

BANGOR, PA.—An electric light plant will be built at this place by a stock company.

MARION, O.—The Marion Electric Railway, Light and Power Company; capital, $100,000.

HARTFORD CITY, IND.—The board of trustees has granted an electric light franchise to A. Reynolds, of Anderson, and has contracted for at least ten 2,000 candle-power arc lights.

AUSTIN, TEX.—The Longview Electric Light and Power Company has been chartered with J. M. Moberly, W. C. Page and Richard B. Levy as directors; capital, $10,000.

DEXTERVILLE, WIS.—Fire destroyed the electric light plant and planing mill owned by George Hiles. The total loss in both plants is estimated at $25,000.

EDINA, MO.—The citizens of the town have voted to light their streets by electricity.

CHESTERTOWN, MD.—An electric light company has been organized with a capital stock of $20,000.

ATTLEBORO, MASS.—The town has by its vote accepted the provisions of the act enabling it to do its own street lighting.

MOODUS, CONN.—It is expected that bids will soon be asked for to light the town by electricity.

PALOUSE CITY, WASH.—Fire destroyed the electric light building and plant. Loss, $15,000.

DETROIT, MICH.—December 19 is the date fixed upon for receiving bids for lighting portions of the city.

LANCASTER CITY, PA.—The new plant in Middletown having been such a success, this city has decided to have another electric light plant.

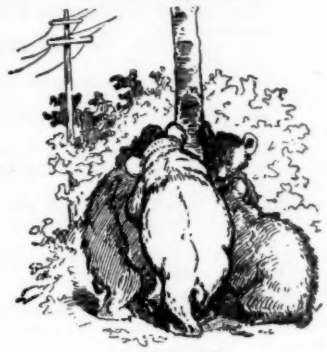
HALIFAX, N. S.—The Nova Scotia Power Company has purchased the entire plant and business of the Halifax Illuminating and Motor Company, and it is understood that the companies will be amalgamated with the Halifax Street Railway Company, and the whole transferred to a Boston syndicate, who will convert the street railway into an electric road.

TOLEDO, OHIO.—David Robison has petitioned the city council for a franchise to operate an electric light plant.

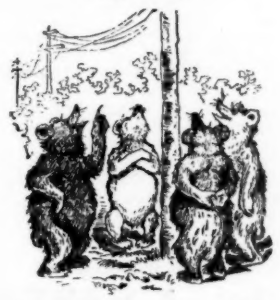
SARATOGA, WYO.—A proposition has been made to the people of Saratoga to light the town by electricity.

BEARS HUNTING BUSY BEES A BOLT OF LIGHTNING FIND.

[*From Brooklyn Life.*]



"IT'S BEES."



"THE HONEY IS AT THE TOP."

"HA, HA! WE'LL GET IT YET."

THEY GET IT.

BARRE, VT.—F. G. Howland and others have been granted a charter as the Barre Electric Light and Power Company, and will organize for business shortly. Water and steam power will be used and the plant will be a large one.

LAKE CITY, MICH.—Lake City wants electric lights and some action will be taken to secure them.

CLAYTON, N. MEX.—The Clayton Electric Light and Power Company; capital, $20,000. Promoter, J. C. Hill.

New Manufacturing Companies.

CHATTANOOGA, TENN.—The Electric Construction Company has been organized to construct electric railways and manufacture and deal in electrical supplies and machinery. The incorporators are F. I. Stone, Robert Pritchard and O. B. Stone.

CHICAGO, ILL.—The Harter Electric Company; capital, $10,000. Incorporators, Gustav A. Harter, Samuel S. Parks and Eden F. Runyan, Jr.

CHICAGO, ILL.—The Kennedy Electric Company; capital, $100,000. H. R. Powers, L. Evans and F. Arnd. The company will manufacture electrical supplies and appliances.

MARLIN, TEXAS.—The Marlin Ice and Electric Light Company has been organized by J. D. Iler and A. W. C. Grotte, of Kansas City, Mo. The erection of a 20 ton ice plant will be commenced at once. The capital stock is $30,000.

PORTLAND, ME.—The Bradbury-Stone Electric Company; capital, $1,000,000; paid in, $90; organized for the purpose of manufacturing and operating electric batteries. President, E. W. Lovejoy, of Lowell, Mass.; treasurer, O. B. Raulett, of Lowell, Mass. Certificate approved, December 5, 1892.

LOCKPORT, N, Y.—The Bolton Carbon Manufacturing Company; capital, $60,000. Incorporators, W. H. Bolton, Geo. P. Smith and Augustus J. Hathaway, of Buffalo. The company will manufacture carbon for electrical supplies.

CHICAGO, ILL.—The Harrison International Telephone Company; capital $80,000. Incorporators, Albert L. Stone, Edward M. Harrison and Chas. M. Feree.

SOUTH OMAHA, NEB.—The Excelsior Electric Signal and Manufacturing Company has been incorporated with a capital of $50,000.

ANSONIA, CONN.—The Electric Copper Refining Company, of Ansonia, has increased its capital from $50,000 to $158,000 and will build an addition to its plant.

A Scientific Dream the Result of Indulgence in Ale.

Before Watts, the discoverer of the present mode of making shot, had his notable dream, induced by over-indulgence in stimulants, the manufacture in question was a slow, laborious and consequently costly process. Great bars of lead had to be pounded into sheets of a thickness nearly equal to the diameter of the shots desired. These sheets had then to be cut into little cubes, placed in a revolving barrel, and there rolled until, by the constant friction, the edges wore off from the little cubes and they became spheroids.

Watts had often racked his brain trying to discover some better and less costly scheme, but in vain. Finally, after spending an evening with some companions at an ale house, he went home, went to bed and soon fell asleep. His slumbers, however, were disturbed by unwelcome dreams, in one of which he was out with "the boys," and as they were stumbling home it began to rain shot—beautiful globules of polished, shining lead—in such numbers that he and his companions had to seek shelter.

In the morning Watts remembered his curious dream and it obtruded itself on his mind all day. He began to wonder what shape molten lead would assume in falling through the air, and, finally, to set his mind at rest, he ascended to the top of the steeple of the Church of St. Mary, at Radcliffe, and dropped slowly and regularly a ladleful of molten lead into the moat below. Descending, he took from the bottom of the shallow pool several handfuls of the most perfect shot he had ever seen. Watt's fortune was made, for from this exploit emanated the idea of the shot tower, which ever since has been the only means employed in the manufacture of the little missiles so important in war and sport.

KINDRED INTERESTS

The F. & F. Electric Company, Cleveland, Ohio, are enjoying a steady run of business in their various lines.

The National Carbon Company, Cleveland, Ohio, is building a large addition to its plant at Lakewood, near Cleveland.

The Fowler Steam Boiler Company, formerly of Lawrence, Mass., is now located in Providence, R. I. It has a capital of $100,000. The officers are: President, L. Sanders; treasurer, G. W. Stafford; general manager, A. J. McClary.

The Buckeye Electric Company, Cleveland, Ohio, report that they are from 60,000 to 75,000 behind their orders for Buckeye lamps. Mr. Rockwell of this company says that a lamp very similar to the new Westinghouse lamp has been burning at the Buckeye factory for six months past.

The Brush Electric Company, of Cleveland, have under order over 50 dynamos of various sizes and between 1,700 and 1,800 arc lamps. They will install 700 arc lights at the World's Fair for both interior and out-door service. About 250 of these will be double carbon lamps and the rest will be single carbon lamps. Nine 60 light arc dynamos and over 500 lamps have already been shipped to the World's Fair.

The Short Electric Railway Company, of Cleveland, are winding up the business of their fiscal year and making preparations to extensively push the Short gearless motor in the spring. They are now satisfied, after two or three years' work, that this motor is about the proper thing, and will proceed at once to execute a number of orders which have been booked ahead. They are making thorough and extensive practical commercial tests of a car equipped with gearless motors which has been put in regular service on the lines of the East Cleveland Railroad Company. Exhibition cars will be running in the regular service in half a dozen or more prominent cities within 60 days. The public, as well as street railway men, will thus have an opportunity to judge the merits of the Short gearless motor, as shown in actual service and operated by the regular employés of the line on which the car is running.

The Annual Meeting of the American Society of Mechanical Engineers.

The twenty-sixth annual meeting of the American Society of Mechanical Engineers was held in the rooms of the society, No. 12 West Thirty-first street, from November 29 to December 2.

The local committee were very fortunate in securing such an interesting set of papers, and the way in which the entire series of meetings were managed proved satisfactory and pleasant to all concerned. The papers were highly interesting and the gastronomic entertainments were thoroughly enjoyable.

The opening session occurred November 29, at 8.30 P. M., an address of welcome by the president, Mr. Charles H. Loring coming first. After this address a light collation was served and the members were given an opportunity to enjoy the evening in smoking and conversation.

At the second session papers were read by the following gentlemen on the subjects named:

C. H. Peabody: "Tests on the Triple Engine at the Massachusetts Institute of Technology."

F. H. Daniels: "An Interesting Boiler Explosion."

James B. Stanwood: "Strains in the Rims of Fly band Wheels, produced by Centrifugal Force."

F. M. Rites: "An Analysis of the Shaft Governor."

On Wednesday afternoon the members visited numerous manufactories and other places of interest in the city and suburbs, and in the evening a delightful reception was held at Sherry's, which closed with dancing.

At the third session papers were read as follows:

W. A. Gabriel: "A New Process for Cutting Cams."

George Richmond: "A Simple Difference Engine."

George W. Bissel: "The Strain in Lathe Beds."

Samuel Webber: "Tests of Driving Belts."

W. F. Durand: "Limit of Propeller Efficiency as Determined by Surface Form of the Propeller."

George Richmond: "Notes on the Refrigeration Process and its Proper Place in Thermo-dynamics."

At the fourth session the following papers were read:

De Volson Wood: "Hydraulic Reaction Motors."

De Volson Wood: "Negative Specific Heat."

H. F. J. Porter: "Shall there be an Overhauling of the Right to Use the Title Engineer?"

John E. Sweet: "Is the Weaving Shed Design the Best Form of Construction for a Machine Shop?"

W. S. Rogers: "To What Extent can the Milling Machine replace the Planer."

At the fifth session, December 2:

D. S. Jacobs: "Experimental Determination of the Heat Generated per Candle Power in Oil Lamps."

W. H. Bristol: "A New Recording Pressure Gauge for Extremely Low Ranges of Pressure."

R. Van A. Norris: "Tests of a Pump Receiving Suction Water under Pressure."

H. C. Spaulding: "A New Transmissive Gearing."

R. C. Carpenter: "Comparative Variation in Economy with Change of Load in a Simple and Compound Engine."

Anthony Victorin: "Performance of an Overhead Traveling Crane Operated by a Single Electric Motor."

John T. Hawkins: "A New Graduating Steam Radiator."

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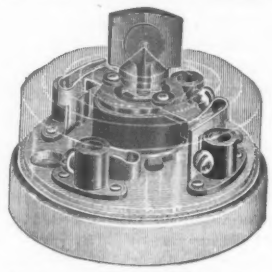
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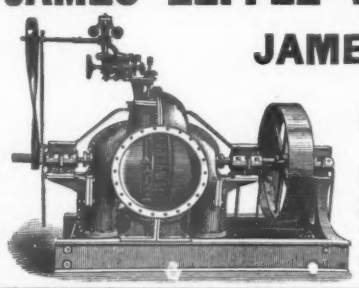
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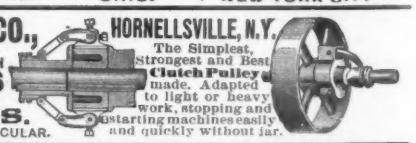
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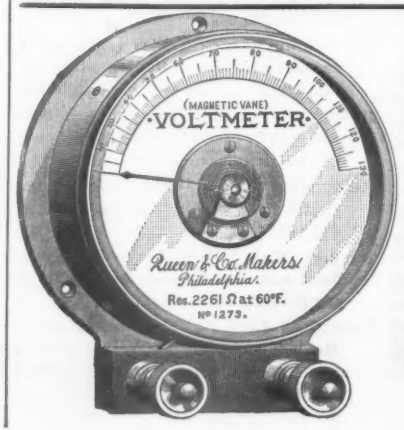

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